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64/128 VIEW

Old Mother Hubbard went to the cupboard to fetch her poor dog a bone, but when she got there, the cupboard was bare—even the 64 products were gone.

Tom Netsel

A funny thing happened today at our cupboard for new software. When I got there and opened its doors, the cupboard was bare. There was no new software for the 64.

Uh-oh! How can I fill all those gaping review pages, when I don't have software to review? There must be something in there that I've overlooked. Desperation does wonders for one's powers of observation.

Aha! There's a package! It's a little dusty, but I haven't seen it before. Surely it's something worth reviewing. We can give it a good workout and milk it for a few thousand words. It's bound to be of interest to millions of Commodore users around the world.

As I wiped the grime from the faded software box, my hopes for filling the review section faded about as quickly as a smile appears on the face of a software rep when I ask, "What do you have new for the 64?" As I struggled to stay afloat in the cruel waters of the publishing business, I realized that this thin yellow package I was grasping was made of straw—and waterlogged straw at that.

The product must have slipped from the shelf above. That's where we put the software that never quite made it into Gazette review pages. That's the shelf where we stash titles such as Great Moments in Bowling for the Adam Coleco or the VIC-20 version of Thermodynamic Equations for LAN Designers.

In this case, the program turned out to be a spelling program from a guy in a

small California town who worked out of a post office box. Unfortunately, it was published in 1984, and was not the stuff to fill my review pages.

It's amazing how things have changed! A few years ago, when I assigned reviews for COMPUTE and Gazette, new software titles vied for attention on several shelves. The 64 titles were king. They filled several shelves at the top of the cabinet. Down near the floor, occupying half a shelf, were the IBM titles.

The 64 was at its peak. Dozens of new titles came in every day. An IBM still cost megabucks, and its software consisted of monochrome productivity titles that cost \$495 each. There were a few games that utilized CGA graphics and managed a puny beep or two, but they paled next to the 64's 16 colors and three-voice SID chip.

As the jiffy clock ticked away, and months turned into years, we had to reallocate shelf space. New titles for the 64 arrived steadily, but IBM products hit us with all the subtlety of a flash flood. Today we have a whole room reserved for IBM software, and the 64/128 shelf resembles Mother Hubbard's cupboard.

A few reviews are in the works, but it'd be nice to see more new things for the 64 again. So take note, software developers: If you have a Commodore product that's never been reviewed, now's a great time to let us and the rest of the Commodore world know about it. Send us a review copy; don't keep it a secret. □

GAZETTE

64/128 VIEW

G-1

It's tough to review new 64 software when the software companies don't send anything new.
By Tom Netsel.

ONE MAN'S WORK DISK

G-2

Pull all of your often-used utilities together, and spend your time at the keyboard more efficiently with a customized work disk.
By Don Radler.

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ONE MAN'S WORK DISK

MAKE YOUR COMPUTING SESSIONS MORE
EFFICIENT BY CREATING
YOUR OWN CUSTOMIZED WORK DISKS.

BY DON RADLER

Over time, most computer users develop a collection of utilities that they find themselves using over and over again. Out of all the programs in a collection, these favorites are the ones that rise to the surface.

Usually, these gems reside on several different disks, arranged in whatever order seemed suitable at the time they were first saved. You have to remember where each one is, refer constantly to some master list, or load and list disk directories like mad in search of exactly the right program for this or that need. Then you have to recall whether program A is compatible with program B or just try it and see. As often as not, the computer locks up.

When I retired a few years ago, I started playing around with a 64. Through the dealer who sold me the machine, I bought someone's collection of several hundred programs on disk. There were utilities, applications, games, and a slew of unidentified—and for quite a while, unidentifiable—programs.

There was no documentation of any kind. The only way I could learn anything about the programs was to load 'em, run 'em, and list 'em. Painfully, bit by bit, I became familiar with the 64. For many people, to know it is to love it. I proved to be one of those people.

Like most people, I learned about the PRINT statement first. As something of a nut about color and composition, I modified the screens on most BASIC programs to make them satisfy my eye. I played with screen color, border color, POKes, and so on. I started reading COMPUTE's Gazette, which became my only tutorial. And I began typing in the programs it published.

Then I had a stroke of luck: The local library sold off its holding of back issues of Gazette at ten cents a copy. I took advantage of that bonanza without hesitation, buying up the complete caboodle. It started with the February 1984 issue and ran slightly beyond the first issue I had bought on the newsstand. With those and my current subscription, I now have every issue from early 1984 to the present, with the exception of June 1989, which is unaccountably missing. (If anyone has one to spare, I'd love to have that issue. The issues before January of 1984 would be of historical value, but are probably too much to hope for.)

And I kept on typing in programs.

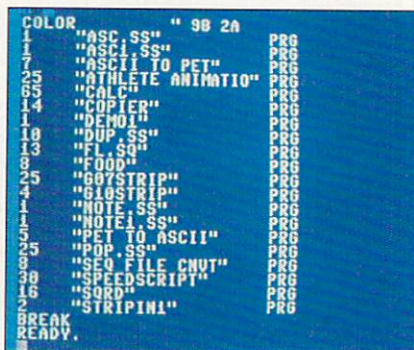
I've Got To Get Organized

Soon I had a truly formidable collection of programs on disk and a crying need to get organized. I was beginning to sell some articles and programs to magazines, so I needed to

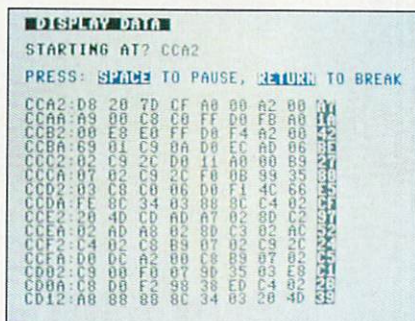
make my programming sessions more efficient. This meant upgrading all my work disks, but especially the one I still keep in the front of the first disk case, the one I use all the time.

Many necessary utilities are stored on this disk, including Gazette's MLX and The Automatic Proofreader. Also stored are supporting utilities for those data-entry programs, which I'll discuss later in this article.

As I discovered new programs and learned more about using them, my work disk changed. As I added new programs, I deleted others. Today, my work disk doesn't look at all like the disk it was even a year ago—and it's



Alphabetical directories are a big help.



Utilities such as MLX go on every disk.

still evolving—but it does make my computing life easier and more efficient.

It's no surprise to me that many of the programs now on that much-used disk are from Gazette. I've typed in a good many programs over the years. It might be of value to other Gazette readers to see how that disk is currently organized, so here's what works for me.

Work Disk

The first listing is Art Hunkins' Keyload from the July 1986 issue of Gazette. I use Epyx's Fast Load cartridge, which loads and runs Art's program when I hit the Commodore and Run/Stop keys simultaneously. Then I simply cursor down to the program I want and hit Return, and it loads and runs. This sequence can be repeated after I've finished with one utility and I'm ready to

use another one. (If I want to look over a listing rather than run the program immediately, I just type an L at the cursor and hit Return—the program loads and waits to be listed.)

Hunkins gets my thanks for writing a version for the Fast Load cartridge. For readers who don't use that cartridge, Art's regular version for the 64 lets you merely type LOAD "",8 to call up Keyload to be run or listed.

First Program

I save Keyload with the filename OKEY for alphabetizing purposes. It's the first program on most of my disk directories. It's great for use on my Sound Effects disk, calling up each sound and letting me hear it just by cursoring to the effect and hitting Return. It's really handy at the top of my Household Helpers disk, running First Aid (October 1984), Monthly Calendar (March 1989), or Speed Reader (February 1984) when I cursor to it and hit Return.

Save the Monitor

After Keyload, the next program on my work disk is Monitor Blackout. This program was printed in a Gazette "Feed-back" column (March 1989). If you think you might be pulled away from the computer for a while, it pays to run this short utility at the start of the session to protect your monitor's screen from burned-in characters. If you don't touch your keyboard after a predetermined length of time, the program blanks the screen to the border color. As soon as you hit any key, the screen returns to normal.

Copy This Disk

Then there's C64 Fast Copy, a disk copier from Kracker Jax that's the smoothest I've tried. It's worth using in place of the disk copier on the Fast Load cartridge. This takes nothing away from Fast Load. I use it all the time to copy, scratch, lock, unlock, and rename individual files, but not to copy a disk. In fact, for formatting a disk and copying or scratching batches of files, I use "none of the above" and switch to my Fast Hack 'Em disk from Basement Boys Software. But its disk copier doesn't match C64 Fast Copy either.

Alphabetical Order

I keep disk directories alphabetized. This makes finding programs easier and speeds up the cataloging process with the disk-management program I use, which takes input from directories. The best program that I've found for this is a Gazette program called Disk Directory Sort by N.A. Marshall (March 1985). Although the program is short (35 lines), it runs too slowly for my

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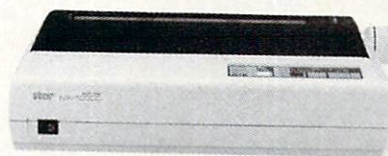
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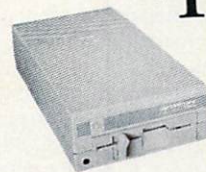
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taste. I compiled it with Blitz!, and now it moves right along. I can recommend the compiled version to anyone.

More Utilities

Next is Lou Sander's Disk Name/ID Changer, a public domain offering from the Tip Master himself. This program changes headers and ID's with a minimum of fuss and, so far, with no glitches.

If you have one program and want to add a subroutine or other code without having to type the program in again, then you need a good merge program to combine the two. The merge program I use is by G.A. Pearce, and it comes from an old Transactor Disk, volume 5, number 2. The program is hassle-free, and it works with Fast Load and/or with the K-prefix utilities mentioned below. The only true merge program I found in Gazette was Disk Merge (January 1985), but it was painfully slow.

Another great program is Randy Thompson's BSAVE Notepad from the April 1988 issue of Gazette. This supremely handy program lets you jot notes to disk at any time. When you run the program, it prints the most recent note on the screen. If you change that note, it replaces the old version with the new one on the disk. You

may enter a screen of text.

Jim Butterfield's sequential file reader in "Machine Language Programming: File Handling" from the same issue is next. This program is written in machine language and, as with most of Butterfield's work, is lean, mean, and useful. As written, it reads a sequential file and prints it to the screen. With one number change in line 350, it will send its output to your printer.

Then there's Quick Print by Chuck Webb from the May 1989 issue of Gazette. With this program, you can send lines to the printer one at a time without first loading a word processor. It will also work without disturbing whatever program you have in memory. It's great for writing notes about the current program or for addressing envelopes or making labels. All it takes to activate this program is a simple SYS address call.

K Utilities

If my work session is going to be one of writing or entering programs, I disable Fast Load and go to a group of utilities filed on the work disk with the initial letter K.

First on the list is Brøderbund's Kwikload. I use the Kwikload-1 option (load at 36096) for compatibility with the next several programs.

First among many is Multi-Utility Wedge, Jim Klitzing's fine multifaceted PD boon to programmers. Among many other goodies, this utility gives you a directory reader that doesn't disturb BASIC programs in memory, an autonumber, renumber, and delete-lines utility. It also has an instant UN-NEW command and abbreviated (two-key) DOS commands including SCRATCH, UNSCRATCH, RENAME, and so on. There's also a two-key screen dump to the printer. On top of all this, there's a simple text editor that loads and saves sequential files in standard ASCII or PET ASCII and can convert files from one format to the other.

For most of my writing chores I use Gazette's SpeedScript word processor. I use it especially for important or formal documents, but if I want to create a sequential file in the middle of a programming session, Jim Klitzing's text editor lets me do it. I can write a few lines; return to BASIC; and, with two key-strokes, go back into the text editor where the file sits waiting for me.

Compatible with this programming marvel (or with Fast Load if I'm not using the wedge) is Gazette's One-Touch Keywords by Mark Niggemann (June 1984). With Keywords you can use any of the letter keys in combination with either the Shift or the Commo-

WHAT WORKS AT GAZETTE

Of all the titles in your disk library, there probably are several that have risen to the top to become the cream of your collection. These programs, through their speed, reliability, and ease of use, have become the workhorses that handle the bulk of your computing chores. In this month's feature article, "One Man's Work Disk," Don Radler talks about his favorites and how they make his computer time more efficient and enjoyable.

His article started me thinking about my own work disk here at COMPUTE and how it's evolved. As editor of Gazette, I need a good word processor. It probably won't come as any surprise that the first tool I put on any disk is SpeedScript, COMPUTE's own word processor. (I used it before I started working here. I typed in the original version years ago.)

SpeedScript is a relatively small program. I like that because I can store a lot of files on a disk with the word processor and keep related material together.

Whenever we write or edit anything for publication, we usually have a specific length in mind. Knowing how many words an article contains is a big help in this regard. Reviews, for example, usually run 750-1000 words. A word processor that counts words is an indispensable tool for professional writers. I modified my word

processor to include this feature with Jonathan Bell's Word Count for SpeedScript (COMPUTE!, December 1986).

When rewriting or editing, I often like to compare the original with the revised version. This is where Larry Hagney's SpeedSwap (COMPUTE, September 1991) comes in handy. It modifies SpeedScript so you can load two files into memory at once and switch between them with a key-stroke. Best of all, SpeedSwap lets you cut material from one file and paste it into another. This great utility program makes SpeedScript even more useful.

Articles, program documentation, reviews, and columns are usually submitted in SpeedScript, ASCII, or Commodore ASCII, which is also known as PETSCII. If a file is in SpeedScript format, I load it into my 128, edit it, and then save it back to disk. From this point, the file must be converted to true ASCII for additional editing and typesetting on our PC-based local area network.

I can print a SpeedScript file to disk as an ASCII file, but I usually save it first and then convert it. For converting, I use Ron Carnell's Sequential File Converter for SpeedScript (COMPUTE!'s Gazette, October 1986). This handy program lets me convert from SpeedScript to ASCII or PETSCII and from PETSCII to SpeedScript.

Two other conversion programs I use are PET to ASCII by Joel Rubin and ASCII to PET by Dave Paul. Rubin's program was released in 1983, and Paul's must be nearly as old. These programs aren't fancy, but they're fast and accurate.

I upload files from my 128 to our BBS and then download them to my Gateway PC and its network. I use a terminal program that I think is called XMODEM Term. I'm not sure what it's called, where it came from, or who wrote it because there's no title or author on any of its screens. It consists of a compiled BASIC file and two machine language files. I needed XMODEM protocol because COMPUTE's old system would accept XMODEM transfers only. Other terminal programs are fancier, but this gem loads quickly and serves double duty as a sequential file reader.

After I fill a work disk, I store it away for safekeeping and create a new one. That's when I boot Ross Ouwinga's Fast File Copier (COMPUTE!'s Gazette, September 1986). I tag all the work programs I want—including Fast File Copier—and it copies them onto a new work disk.

These are the programs that work for me. I am comfortable with them. They make me more productive and my work easier. Isn't that the whole idea?

—TOM NETSEL

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dore key to print BASIC keywords to the screen. Once you've learned the 52-word language, it speeds up writing and entering programs enormously. Now I'm spoiled—I wouldn't want to type in a program without it.

Whenever I type in a program from Gazette, I always use The Automatic Proofreader. It's a handy program that helps me avoid typing errors. These three utilities are compatible with Proofreader, which I enter after the first three are installed. I've found that these utilities, when used with Jim Klitzing's autonumbering utility, make typing Gazette programs almost fun.

Avoid Typos

Whenever I type, I make errors. I do have a couple of ways to avoid the slowdowns caused by typing blunders.

I have two Cardco numeric keypads that I picked up somewhere along the line. Either one will plug into joystick port 2. On one, I pasted data-entry letters over the keys, and on the other I put the MLX keypad letters. I put Cardco's KBASIC program on the work disk, along with the sequential files it lets me create for each of these conversions. The MLX entry pad is a real timesaver, virtually wiping out the typos made by my fumbling fingers. With two keys devoted to commas, the

data entry pad almost eliminates the period-instead-of-comma hangup that plagues many data-statement entries.

Three Computers

Finally, there is Triple 64 by Feeman Ng, from the April 1985 issue of Gazette. This little (seven-line) program divides the 64's memory into three independent 12K sections, each accessible with SYS 40004 followed by the number 1, 2, or 3. Within these sections of memory, different modules of a program can be entered and tested, or three totally different programs can be tried out. It's like having three superfast 12K disk drives at your disposal and not unlike having a RAM disk. I use Hubert Cross's 64 RAMdisk from the Gazette 1988 Special Issue for several purposes, but not for ordinary program-entering or programming sessions.

Triple 64 works with Kwikload and the Klitzing wedge installed. Without that combination, it works with the Fast Load cartridge enabled. In either case, it installs itself where it fits and gives you the correct SYS address to toggle it on and off.

My Way

If you'd like to try out the Gazette program-entry setups, I've found the following combinations work well for me. If

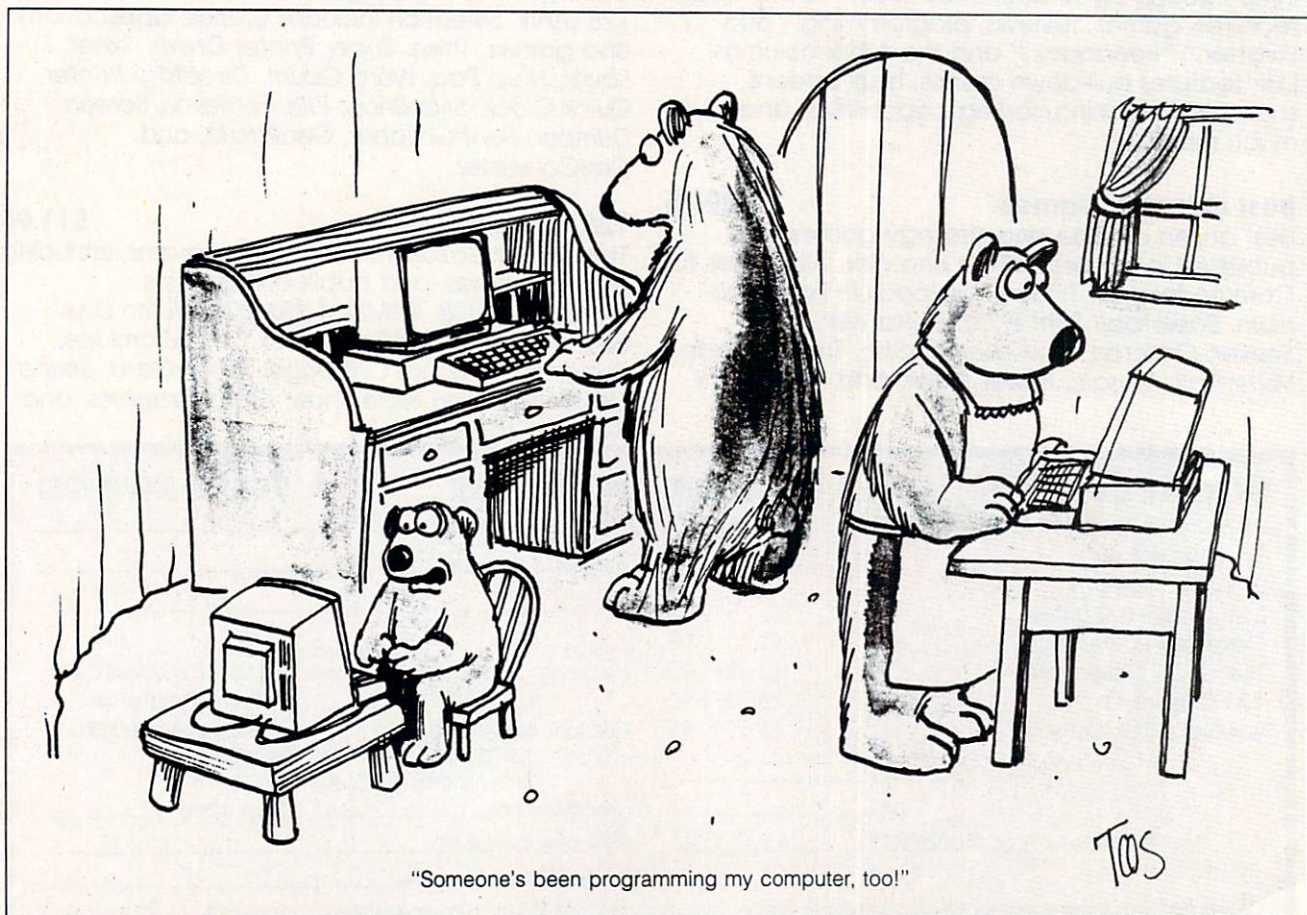
you're going to enter BASIC program listings from the magazine, run Kwikload-1, then Jim Klitzing's wedge, then Keyword, and finally Gazette's Proofreader.

When you want to type in machine language listings using MLX, run Kwikload-1 and then KBASIC (Cardco's keypad software); then call up the keypad modification for MLX; and, finally, load and run MLX itself.

By looking over the collection of programs you've downloaded or typed from Gazette or other magazines, you can probably come up with some gems of your own that you may have overlooked. By combining your most frequently used programs on one disk, you can customize a work disk that will let you work more efficiently.

You may have several work disks on hand, depending on your computer activity at any one time. While my work disk suits my programming needs, a computer artist would have an entirely different set of programs and utilities. Musical programmers, writers, and game designers would have their own customized disks.

So take a look at your files, your user group library, or local BBS offerings and put together your own custom work disk. It will make your computer time much more productive. □



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SUPRA 2400 MODEM

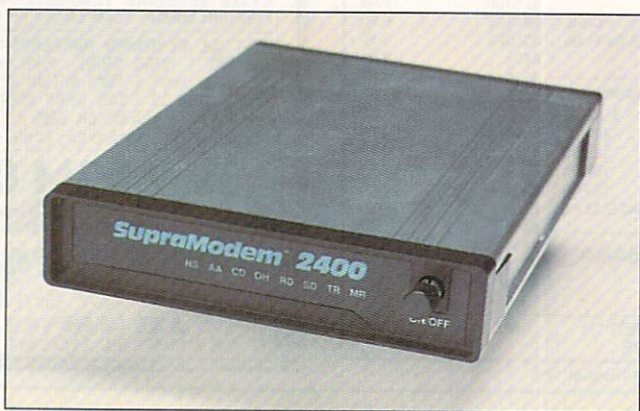
Supra 2400 is an external RS-232 modem that I can recommend. It's been around for several years, long enough for individuals, businesses, and BBSs to shake out any hardware bugs that it might have had.

It's smaller than a Beta videotape, is solidly built, and has eight LEDs that indicate the various modem operations. Supra 2400 is a Hayes-compatible smart modem that supports AT commands, extended & commands, and result codes. It has several internal registers for controlling modem functions. The modem works well with most popular shareware and commercial telecommunications programs, BellTerm, Bobs Term, NovaTerm, and Elite Term being some of the readily available ones.

Supra 2400 is cool running, which certainly adds to its ability to transmit data for long stretches of time without errors. At 2400 bps, transmission is obviously more likely to be affected by phone-line noise than it would at lower baud rates. Supra 2400 uses adaptive equalization and impedance matching like most other modems do and gives you long sessions of error-free transmissions.

Supra 2400 supports several modem tests. A power-on test automatically checks out the modem every time it's turned on. There are also manual and self-running analog and digital loopback tests in which the modem generates and sends signals to itself to check that everything is functioning. One interesting feature of the Supra 2400 is its

nonvolatile memory. Even after the power is turned off, the modem will store one telephone number. While this feature is welcome, it's overshadowed by the fact that many other terminal programs support their own phone directories and store dozens of numbers.



Supra 2400 is a cool-running external modem that can give you long sessions or error-free transmissions.

There's an error in the Supra manual regarding the store feature. The correct command sequence for storing a telephone number is AT&Z= followed by the dial type (T for tone or P for pulse) and the telephone number, as in AT&Z = T5551234. The equal sign character is missing from the documentation in the manual. This supposedly has been corrected by an addendum, but the addendum wasn't included with my modem. However, using the AT&W command for storing any modem settings is a more useful application of the nonvolatile memory. The settings with AT&W load automatically whenever the modem is turned on, which saves you the trouble of having to reach for the manual or the supplied reference card at each session.

I particularly like Supra 2400's power switch. It

used to be that whenever I turned on my computer, my old modem would scream like a cat in heat; now peace reigns with my Supra 2400. If I want to hear a call in progress without insulting my ears, I can control the volume of the modem's speaker via the software. Supra

users. However, a good telecommunications program takes care of the technical aspects of using a modem, and you never need to bother with all those AT and & commands and what registers do. Troubleshooting is very well covered. And the best news is that Supra 2400 has a street price of less than \$100 (cheaper by mail order) and comes with a five-year limited warranty.

RANJAN BOSE

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PANASONIC KX-P2123

Despite the progress made by 9-pin dot-matrix printers in improving their NLQ (Near Letter Quality) fonts, their output just doesn't match the quality of a 24-pin printer. A 24-pin printhead essentially has three offset columns of 8 pins each. By printing each line of characters in a single pass, it not only prints faster than its 9-pin ancestor, it also achieves smoother curves and diagonals on letters such as O, C, V and Y.

The downside is that most 24-pin machines are noisy. That's because they have more pins and they print faster. A typical 9-pin character uses a matrix of 18 x 18 dots, whereas a 24-pin character uses a matrix of 30 x 24 dots and gets printed at roughly twice the 9-pin speed. Most 24-pin printers sound like a dentist's drill and preclude any conversation nearby. Anything that could be done to make them quieter would be appreciated. Enter the new line of

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REVIEWS

Panasonic machines.

Panasonic printers have always been known for their letter quality (LQ) fonts, and now it's comforting to see that their new product line has been made quieter as well. The new line's latest offering includes the 9-pin KX-P2180, the wide-carriage 24-pin KX-P2624, and the 24-pin KX-P2123. The KX-P2123 should be especially attractive to most Commodore owners.

Not only is the KX-P2123 quieter than earlier models, it also has several new features with hardly any increase in price. The new model has a 14K buffer, compared to 10K on the KX-P1123. The new buffer can hold approximately seven double-spaced pages of text! Adding a Xetec Super Graphics Jr. interface and a LQ speed of 40 characters per second means that your computer will become available about six minutes before the printer spills out the last line.

The earlier Panasonic fonts (Pica, Elite, and Micron in draft quality; Courier, Boldface PS, Prestige, and Script in letter quality) are all there, but some new ones have been added. There are lightweight Roman, medium-dark Sans Serif, and a (slower but darker and sharper) Super Letter Quality Roman font (not available in IBM emulation). For 64 users, resident LQ fonts such as these are vital. Although GEOS offers a variety of fonts, they don't look professional. It's nice to have a printer with a variety of crisp internal LQ fonts.

The printing speed of the KX-P2123 is said to be as fast as that of the KX-P1123, but the real improvement is in the significantly lower noise level. Sound is measured on a log scale and each reduction by 3 dB (decibels) represents a 50-percent reduction in volume. At 8.5 dB quieter than its predecessor, the KX-P2123 is about one-eighth as loud as the KX-P1123. This noise reduction has been achieved by adding thicker and bigger covers, foam blocks, and technology that Panasonic calls Quiet Touch. Panasonic has found that noise is reduced when the pins are fired in a random manner, rather than in the sequential manner used by conventional printers.

The KX-P2123 can load fanfold paper either from the rear (tractor push) or the bottom (tractor pull). Single sheets can be fed from the top, and an optional sheet feeder is available. Single sheets or envelopes can be used after first "parking" the fanfold paper. A "zero-inch tear off" is a convenient paper-saving feature that advances a recently printed sheet of fanfold for tear-

ing and then retracts the blank sheet back to printing position. The KX-P2123 becomes a seven-color printer by adding a relatively inexpensive color cartridge and motor option.

On the negative side, the KX-P2123 retains its predecessor's somewhat convoluted LED matrix front panel for setting a multitude of printer options such as the font, pitch, form length, quiet mode, margins, and macros. It does get easier once you work with it a while, but, initially, keep a bottle of aspirin and the manual handy.

The KX-P2123 emulates Epson LQ860 and IBM Proprinter X24E. GEOS users will be happy to note that the drivers for KX-P1124 (and also for the 24-pin Epson) work with this printer. Programs that allow you to define printer configuration files, such as The Write Stuff, also work with a minor effort. If your program supports only older Commodore printers, however, then you're limited to using the interface-based Commodore fonts that generally don't use the higher resolution of 24-pin printers. The Xetec Super Graphics Jr. (ROM version 1.3 and 1.46) works well in transparent mode as well as in Supergraphix and 1525 emulation modes. For 64 users, the primary advantage of using a 24-pin printer would have to be in text-based applications. You can easily churn out a professional-looking document with a KX-P2123.

Most 64 graphic programs don't exploit the highest density available on 9-pin printers (216 dpi); therefore, they can't use the higher (360 dpi) resolution of 24-pin printers. The 24-pin's finer dot size and arguably better linearity (alignment of dots), however, might improve the appearance of the hardcopy.

Although the nylon ribbons that are universally used by dot-matrix printers are economical and satisfactory, it's a pity that Panasonic and other manufacturers don't produce carbon film ribbons. These would offer a truly high-quality output option for those who want their documents to look their best. A conventional nylon ribbon actually reduces the apparent sharpness of a 24-pin printer. This can be quickly demonstrated if you print a few lines (without the ribbon) through a quality sheet of carbon paper placed over the printer paper.

Never print without the ribbon for more than a few lines, though. In addition to ink, ribbons carry lubricants that help cool the printhead and protect it from damage.

I found that, when using any of the double-pass printing modes, the output is better if the curved clear-plastic top of the removable pull-roller on top of the platen isn't clamped down. This is a gear-driven assembly that normally

pulls the paper and keeps it taut. When locked down, it tends to pull the paper a touch too vigorously, resulting in some characters having a dotted or broken appearance. The pull is gentler, yet adequate, when the curved top is resting on the paper, not down all the way.

Before using the tear-off feature or fan-fold parking or before loading for the first time, remember to set the top-of-form option. The manual neglects to mention this.

One way to reduce noise even further with this printer is to adjust the print-head gap with the supplied lever. The chatter appreciably diminishes as you move the printhead closer to the paper (subject to paper thickness).

If your computer system is used for any text-based application and you need good quality professional print-outs but cannot afford or justify the purchase of a laser printer, then the color-upgradable Panasonic KX-P2123 with its two-year warranty is a reliable, efficient, and economical alternative.

RANJAN BOSE

Commodore 64 and 128, printer interface required—\$419.95

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NOVATERM 9.3

NovaTerm is a powerful and well-designed telecommunications program that works well with Supra 2400 or any other modem. In addition to the 64's standard 40-column display, NovaTerm supports an 80-column ANSI (or VT 52/102) graphics screen. Nitpickers will always find fault with the clarity of an 80-column display on a 64, but at least that option exists. The program is easy to use and provides several protocols, XMODEM (CRC and checksum), YMODEM, Punter, and others, to ensure error-free transmission of data.

NovaTerm has a smallish buffer (8K), but you can automatically direct any buffer overflow to disk. Even if your system is equipped with DOS speed-up utilities, Commodore drives can slow down the data stream if you use large-block (1024 bytes) transfer protocols such as XMODEM 1K or YMODEM. NovaTerm supports RAM expansion units (REU) and can considerably enhance your system's efficiency. If your system doesn't have an REU and the file to be uploaded or downloaded is smaller than 8192 bytes, then the NovaTerm buffer (RAM disk) can be used to achieve the same end. The program works well

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with JiffyDOS. While a CPU accelerator such as Schnedler System's 4-MHz Turbo Master CPU cannot be expected to increase the actual telecommunications speed (after all, 2400 bps is 2400 bps!), it does reduce the processing time required by the computer. This becomes apparent when you notice the faster scrolling and display. Unfortunately, Turbo Master isn't fully compatible with NovaTerm. YMODEM doesn't work when you're saving a file to the disk with the CPU running at 4 MHz. Saving to a buffer does work, however. XMODEM works well without significant improvement over native 1-MHz mode. Also, during half-duplex transmission, with the modem echoing characters that you type, the characters appear as garbage on your screen, but they're transmitted correctly. This can be confusing, so I'd recommend disabling the cartridge when using NovaTerm.

NovaTerm has the de-

sired complement of file editors and autorun scripts. By using the latter, your computer can go online at a certain time, collect messages, download or send files, and hang up without your having to baby-sit the process!

Aprotek distributes NovaTerm as shareware with its modems. You can also download the program from Aprotek's BBS at (503) 582-1225. Callers can download the documentation and the related files on the first call. NovaTerm is also available on QuantumLink and GENie.

Since this program is shareware, you're invited to try it at no charge. If you decide it's useful, send author Nick Rossi a donation of at least \$20. Version 9.4 should be available by the time this review appears.

RANJAN BOSE

Commodore 64 and 128—\$20 (requested)

NICK ROSSI
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BUG-SWATTER

Due to an error that occurred during printing, a portion of the documentation of Revelation (August 1992) was omitted. Here is the missing text, beginning with the third paragraph.

This is only a simple example; the technique opens up myriad possibilities for the programmer. For example, the technique can be extend-

ed to larger, expanded sprites occupying 21 x 21 pixels to reveal larger blocks of text or user-defined characters. Sprites can be used in conjunction to reveal whole sections of the screen display. More complex techniques can be produced by using sprites which aren't completely solid but are patterned or shaped. □

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64 to IBM Format

I have two 64s and two 1541 drives. I have been using them for about three years. During that time, I've built up a large collection of programs and SpeedScript files, which includes hundreds of recipes. Now I've purchased an IBM compatible. What do I need to convert these files so I can use them on my IBM?

CAMERON C. STEELE
SPENCER, IN

The first problem is the one of transferring your 64 files to the IBM. This transfer can be accomplished by using terminal software and modems to upload and download the files to a bulletin board or even to move them directly between the two computers.

If you have access to a 1571 drive, there are several utilities, such as SOGWAP's Big Blue Reader, that will copy a file from a Commodore-type disk and write to an IBM disk.

This process works quite well when transferring text files. Although the 64 uses its own set of characters, PETSCII, as opposed to IBM's ASCII, converting between the two is fairly easy to do. With word processors such as SpeedScript, you can save files as ASCII or convert them with utilities such as Sequential File Converter. Special codes for centering and underlining may be a problem, but these can be stripped out of the text before the file is converted to ASCII.

There's a real problem, however, if you want to convert programs that will actually run on the IBM. BASIC programs are tokenized, which means that keywords such as IF, THEN, and GOTO are represented by a special token, or single byte. When a program is listed, however, the token is converted to the appropriate

word on the screen, so that people reading the listing know what it is. The specific bytes used for indicating keywords are native to the 64, so these tokens must be replaced with their equivalent bytes or the actual set of characters before any transfer can take place.

Utilities that will take BASIC programs and put them into a text form do exist for the 64. Most computers have software available that will take a program in text form and convert it to a BASIC program, including the IBM. Unfortunately, not all BASICs have the same keywords, so there might be a compatibility problem. Only very simple BASIC programs can be converted.

If your 64 program contains POKES and PEEKs, the addresses are going to mean totally different things on an IBM. Machine language code is definitely nontransferable because the 64 and IBM use different microprocessors with different sets of instructions.

ML Pokes to Screen

How can you make a small machine language program on the 64 that pokes values to the screen from a certain address range?

ROCQUE BEAUPRE
HANMER, ON
CANADA

Let's say you have the values you want to have transferred residing in memory starting at hex address \$C123 and the target region starting at some other address. What's more, let's say that we have 32 bytes to be moved, a hexadecimal value of #\$20.

The high byte of the source address is \$C1, and the low byte is \$23. We'll symbolize this with source high byte (SHB) and source low byte (SLB). Similarly, we'll symbolize target high byte (THB)

and target low byte (TLB). The following assembler code shows how the transfer is done.

LDA #SHB ; source high byte,
in this case, \$C1

STA \$FC
LDA #SLB ; source low byte,
in this case, \$23

STA \$FB ; \$FB,\$FC serves
as a pointer

LDA #THB ; target high byte

STA \$FE

LDA #TLB ; target low byte

STA \$FD ; \$FD,\$FE serves
as a pointer

LDY #\$00 ; Y register will
serve as an offset

LOOP

LDA (\$FB),Y ; load accumulator
with the value at
the
; address whose
low byte is stored
in register
; \$FB and whose
high byte is stored
in register
; \$FC and offset by
the value in the Y
register.

STA (\$FD),Y ; load the accumula-
tor with the value
at the
; address whose
low byte is stored
in register
; \$FD and whose
high byte is stored
in register
; \$FE and offset by
the value in the Y
register.

INY ; increment the Y
register

CPY #\$20 ; have all 32 bytes
been passed?

BNE LOOP ; if not, loop
through the trans-
fer again

Typing in Hex

Is there a trick or utility that will allow me to use hex addresses instead of decimal when typing POKES and SYS commands in BASIC? The BASIC interpreter must convert

Questions
and answers about
converting
formats, poking ML
to screen,
typing in hex,
and more

Suggestions about computing languages and ways to show Gazette Gallery art in a slide show

the decimal address to hex or binary, so it should be possible to intervene in this process to handle hex addresses.

G. N. ADAMS
SACKVILLE, NB
CANADA

Your question obviously concerns the 64, since the 128 has functions for converting between decimal and hex.

Indeed, the BASIC interpreter does convert decimal addresses to the computer's own numbering system for its processing, but you can't simply feed it a hex value. Any hexadecimal value you type in must be processed just as a decimal value. After all, it's simply a string of characters when typed, and any string must be processed for meaning. After processing, the final form is in binary (base 2), not hexadecimal (base 16).

We use base 16 when doing assembler programming because it's more convenient for coding. Because 16 is the fourth power of 2, any binary number can be grouped in fours, each four bits receiving one hex digit.

If you want to use hex in your BASIC program, you'll need a subroutine for converting the hex to decimal. Here's one that'll do it.

```
5 REM INITIALIZE
  SUBROUTINE VARIABLES
10 L=LEN(H$): FAC=1:
  MIN=ASC("A"):DV=0
20 FOR X=L TO 1 STEP -1:
  CH=ASC(MID$(H$,X,1))
30 IF CH>=MIN THEN 38
35 V=VAL(MID$(H$,X,1)): GOTO
  40
38 V=CH-MIN+10
40 DV=V*FAC+DV: FAC=FAC*16
50 NEXT: RETURN
```

The hexadecimal number is sent to this subroutine as a string of characters in H\$, and the decimal equivalent is returned as a value in DV.

The subroutine makes use of the additional variables L, FAC, MIN, X, CH, and V.

To use this routine to poke the hex value #20 into hex address \$04EA, for example, you might set up a line of code like the following.

```
5 H$="20":GOSUB 10:
  XX=DV:H$="4EA": GOSUB 10:
  POKE DV,XX
```

Which Language First?

I am interested in becoming a computer programmer. I am 14 years old and in the 9th grade. What languages should I learn, and in what order should I learn them?

JASON SPINETTI
BUTLER, PA

Personal computers all work fundamentally the same way. Information is processed one step at a time. Processing may require looping back through a set of instructions or branching to another part of the program according to some test done upon the data. In this sense, one computer language is like another.

Since the first skill of a programmer is to think like a computer—breaking a problem down into terms the computer can understand—the choice of language isn't really important. It's only later, when your skills become more finely honed and the problems you present the computer with become more elaborate or specialized, that you need to worry about the merits of one language over another.

Probably the easiest language to learn is BASIC. It comes packaged with your computer, and its commands are easy-to-understand English words. People will argue and say that C is best or that they don't use anything but Pascal. Others will claim that to be really effective, machine language is the only answer.

Hogwash. Any language will do for starters, and no language has a monopoly on usefulness. Our advice is to start with BASIC.

Gallery Art

I am a subscriber to the Gazette Disk and really enjoy the Gallery art included each month. Keep it up!

I'd like to display all of the art in a slide-show program, and I noticed that there is a program called Super Slide-show in the May 1989 issue of Gazette. Is it possible to transfer Gallery art to another disk and use Super Slide-show to display it? If so, how do I go about transferring Gallery art?

BOB LYONS
SIMI VALLEY, CA

All of the art that you see on the Gazette Disk is in either Doodle or Koala graphics format. Both of these formats can be displayed by Super Slideshow. (By the way, we need more Gallery submissions; we pay at least \$50 for each one we use.) The only thing that would need to be changed is the name of the Koala-type files. Koala files use a 15-character name (padded with spaces if the name is less than 15 characters). The name's first 7 characters consist of CHR\$(129) (a reversed spade), the letters PIC, a space, another letter, and then another space. The filename itself comes after these 7 characters.

The Gallery art viewer, in order to let us use longer filenames, looks only for that initial reversed space, and that's all Gallery art in Koala format has. In order to use Super Slideshow with Gallery art, therefore, the additional characters, PIC, a space, a letter, and another space, are needed. Any file copier will copy the picture files. □

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BEGINNER BASIC

Larry Cotton

WHAT DOES THIS KEY DO?

Back in March 1991, I asked you readers for some help in writing this column. I got lots of suggestions, for which I thank you! This column is in response to one reader who asked that I explain the keys unique to the 64 and 128.

The 64 and 128 are blessed with special keys that other computers don't have. (The 128 also has 26 extra keys, which give it even more functionality.) Some of the 66 keys common to the 64 and 128 have dedicated functions, some seem to work some of the time, and others seem to do absolutely nothing.

As a general statement, all keys are internally hard-wired to do particular things. By clever BASIC programming, however, you can override most of their normal functions until the power is turned off. For instance, in SpeedScript, which I'm using right now, the left-arrow key is programmed to move the cursor to the left, deleting as it moves. Epyx's Fast Load cartridge, however, programs that same key to save a BASIC program.

Those two examples happen to be programmed in machine language, but we can do the same things (albeit more slowly) in BASIC. To do this, we should know two things about each key: its CHR\$ code and its keyboard matrix value. The CHR\$ codes are contained in the computer's manual and other reference guides. The other values can be determined by entering this short program.

```
10 PRINTPEEK(197),PEEK(653)
20 GOTO10
```

When you run it, you'll see two values that represent what's in these memory regis-

ters, depending on which keys are pressed. When no key is pressed, 197 contains 64, and 653 contains 0.

Each key (except Shift, Ctrl, Commodore, and Restore) causes a unique value to appear in 197, based on the keyboard's wiring. If two or more keys are pressed simultaneously, one of the keys will dominate the others. Note that even the Run/Stop key has a value (63), which you can see by holding Shift and pressing the Run/Stop key.

The value in 653 depends on the status of the Shift, Ctrl, and Commodore (C=) keys; the values are additive, as shown below.

Key Pressed	653's Value
Shift	1
C=	2
Shift/C=	3
Ctrl	4
Shift/Ctrl	5
Ctrl/C=	6
Shift/Ctrl/C=	7

Let's write another short BASIC program that illustrates how to put this knowledge to work for us by programming the function keys to change background and text colors.

```
10 PRINTCHR$(147):POKE646,1
20 K=PEEK(197):S=PEEK(653)
30 IFK<30RK>6THEN20
40 IFS=0 THEN ON K-2
   GOTO100,110,120,130
50 IFS=1 THEN ON K-2
   GOTO140,150,160,170
100 C=5:W=0:GOSUB500:
   GOTO20
110 C=6:W=1:GOSUB500:
   GOTO20
120 C=3:W=2:GOSUB500:
   GOTO20
130 C=4:W=3:GOSUB500:
   GOTO20
140 C=7:W=4:GOSUB500:
   GOTO20
150 C=10:W=6:GOSUB500:
   GOTO20
160 C=11:W=5:GOSUB500:
   GOTO20
```

```
170 C=12:W=7:GOSUB500:
   GOTO20
500 POKE53280,C:POKE53281,C:
   POKE646,W
510 PRINT "LIKE THIS COMBI-
   NATION?[UP]":RETURN
```

Line 20 checks memory registers 197 and 653. Since we're looking only for function key activity, we weed out all other keyboard matrix values in line 30. Lines 40 and 50 determine whether the Shift key is pressed or not and then the ON-GOTO statement is used.

```
10 PRINTCHR$(147):POKE646,1
20 BG=53281:BO=53280
30 GETAS:IFA$=""THEN30
40 V=ASC(AS):IFV<133 ORV>140
   THEN30
50 ONV-132 GOTO100,110,120,
   130,140,150,160,170
60 GOTO30
100 BG=5:BO=0:GOSUB500:
   GOTO30
110 BG=6:BO=1:GOSUB500:
   GOTO30
120 BG=3:BO=2:GOSUB500:
   GOTO30
130 BG=4:BO=3:GOSUB500:
   GOTO30
140 BG=4:BO=8:GOSUB500:
   GOTO30
150 BG=10:BO=6:GOSUB500:
   GOTO30
160 BG=11:BO=5:GOSUB500:
   GOTO30
170 BG=12:BO=7:GOSUB500:
   GOTO30
500 POKE53281,BG:
   POKE53280,BO:PRINT
   "LIKE THIS COMBINA-
   TION?[UP]":RETURN
```

Line 30 waits for a keypress. Line 40 gets the ASCII value of A\$, subtracts 132, and then uses ON-GOTO to choose the appropriate line.

Of course, you'll probably want to do more important things than just change colors with the function keys, but this should give you enough information to get started. Next month we'll look at more unique keys. □

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Jim Butterfield

SMOOTH SCROLLING

Pixel scrolling seems simple. Experimental POKES on a 64 to address 53265 or 53270 (hexadecimal D011 or D016) will show how the screen may be shifted one pixel.

The tough part comes when you reach the limit of a pixel register, which goes from 0 to 7. At that time, you must move every one of the characters onscreen to a new location and then reset the pixel count.

So, can we move 1000 bytes in less than 1/60 second? Practically speaking, it can't be done, not even at the blinding speed of machine language. And if we are working with a high-resolution screen, we need to move 8000 bytes. So many bytes, so little time. It's out of the question.

There is a way around it, though: double buffering. Here's how it works. We have two screen areas set up in memory. One screen is being displayed, and the other is being constructed. When the second screen is complete, we tell the video chip to switch its attention to the new location. It now becomes the "real" screen, and we can start to build a new display in the former screen-memory area.

It still takes time to do this, but the switch won't take place until the new screen is completely built. Both pixel scrolling and the screen switch benefit from careful timing. We must pull the switch during retrace to ensure that there will be no flicker or screen jump.

The following is a simple smooth-scroll program for the 64 that demonstrates this technique. The code is stored in the cassette buffer memory area. Because of its size, we'll focus our attention on selected

parts of the program. You may enter the BASIC program, run it, and then disassemble the machine language code if you want to see details.

Our two screen buffers are located at 32768 and 33792, hexadecimal 8000 and 8400. We build the new screen by copying characters from the other, active, screen. The direction of our scroll is up, so we drop the first 40 characters from the old screen, copy the rest, and then fill the bottom line of the new screen with space characters.

The program uses two indirect addresses to do this copying: \$26/27 holds the "from" pointer, and \$28/29 the "to" pointer. As we flip between the two screens, the two pointers are set appropriately.

The first thing the program must do is copy the screen. That occupies code from \$033C to \$037E. A short loop follows to pad the bottom line with space characters.

At \$038A, we walk the old screen through its pixel scroll. Since we're scrolling in the up direction, our objective is to step the Y pointer from 7 down to 0. That pointer is stored in the video register at \$D011, which also contains the video-enable signal as bit 4. So the value that we stuff into that register will step from \$17 down to \$10; we hold this value in the X register.

Before each pixel scroll, we wait for a screen retrace. We do this by watching that same register, \$D011. Its two highest bits tell us about the raster. When the value of those two bits goes down, it's retrace time.

In fact, we wait for six retrace events. We don't want our pixel scroll to be too fast, or the user might miss it. Each retrace happens in about 1/60 second, so a loop of six retraces will slow our pixel movement to 10 per second.

; scroll seven pixel positions

038A LDX #\$17

; wait about 1/10 second

038C LDY #\$05

; wait for screen retrace

038E LDA

\$D011

0391 AND

#\$C0

0393 CMP

\$03D0

0396 STA

\$03D0

0399 BCS

\$038E

039B DEY

039C BPL

\$038E

; do pixel scroll

; set up

next

039E STX \$D011

03A1 DEX

03A2 CPX #\$10

03A4 BCS \$038C

Now the pixel scroll has reached its limit. Our screen characters are set; we simply flip to the new screen. We must also return the pixel counter to its highest value. Moving the characters is the equivalent of eight bits of scrolling, so we back off seven bits to produce a net one-bit scroll.

03A6 LDX #\$17

03A8 LDA \$D018

03AB EOR #\$10

03AD STA \$D018

03BD STX \$D011

The above coding puts the two store instructions close together to minimize possible screen jump. In fact, we're quite safe, since all this is being done in retrace time.

A small amount of extra coding is added. Its purpose is to reposition the cursor so that the next time we print, the information will go to the new screen and be printed at the appropriate place. This involves storing a new value in address \$0288. The Kernal

Use a double buffer to produce extremely fine scrolling on your 64's screen.

routines use this address to find the screen.

The program code shows a character screen moving in one direction only. Once you understand the principles involved, you can take on more ambitious jobs.

```

BX 100 DATA 169,40,133,3
      8,169,0,133,40,16
      2,128,160,132,134
      ,39,132,41,169,16
HP 110 DATA 44,24,208,24
      0,4,134,41,132,39
      ,162,0,160,0,177,
      38,145,40,200,192
      ,40
DC 120 DATA 144,247,24,1
      65,38,105,40,133,
      38,144,2,230,39,2
      4,165,40,105,40,1
      33,40
FM 130 DATA 144,2,230,41
      ,232,224,24,144,2
      18,169,32,160,0,1
      45,40,200,192,40
SF 140 DATA 144,249,162,
      23,160,5,173,17,2
      08,41,192,205,208
      ,3,141,208,3,176,
      243
EQ 150 DATA 136,16,240,1
      42,17,208,202,224
      ,16,176,230,162,2
      3,173,24,208,73
AB 160 DATA 16,141,24,20
      8,142,17,208,173,
      136,2,73,4,141,13
      6,2,169,145,32,21
      0,255
XS 170 DATA 169,13,76,21
      0,255
EB 200 FOR J=828 TO 964
DP 210 READ X
CG 220 T=T+X
FQ 230 POKE J,X
QF 240 NEXT J
MJ 250 IF T<>15776 THEN
      {SPACE}STOP
BD 280 POKE 55,0:POKE 56
      ,128:CLR
DX 300 POKE 53265,23
MG 310 POKE 56576,5
XB 320 POKE 53272,4
KH 330 POKE 648,128
KD 340 PRINT CHR$(147)
JE 350 FOR J=1 TO 22
CS 360 PRINT
PS 370 NEXT J
HK 380 PRINT "THIS IS AN

```

```

      EXAMPLE";
MQ 390 SYS 828
FA 400 PRINT "OF PIXEL S
      CROLLING";
HQ 410 SYS 828
AJ 420 PRINT "WITH DOUBL
      E BUFFERING";
XS 430 SYS 828
FF 440 PRINT "I HOPE YOU
      LIKE IT";
HX 450 SYS 828
DS 460 FOR J=1 TO 1000:N
      EXT J
ER 800 POKE 648,4
GJ 810 PRINT "END!"
JM 820 POKE 53272,20
FJ 830 POKE 56576,7
DF 840 POKE 53265,27
BD 850 REM NEXT POKE OPT
      IONAL
KA 860 POKE 55,0:POKE 56
      ,160:CLR

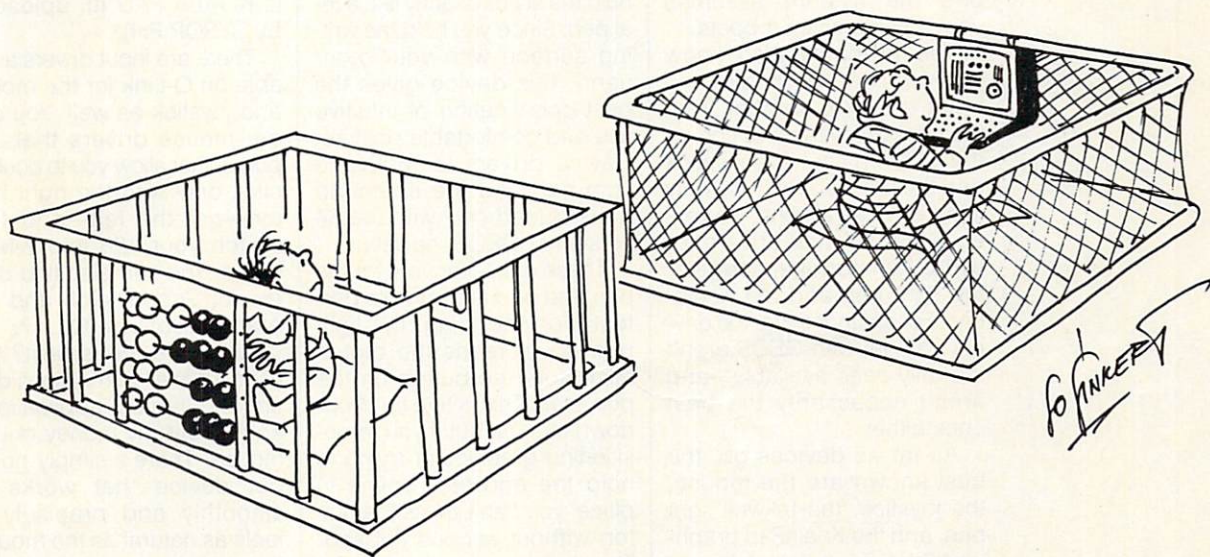
```

TYPING AIDS

MLX, our machine language entry program for the 64 and 128, and The Automatic Proofreader are utilities that help you type in Gazette programs without making mistakes. To make room for more programs, we no longer include these labor-saving utilities in every issue, but they can be found on each Gazette Disk and are printed in all issues of Gazette through June 1990.

If you don't have access to a back issue or to one of our disks, write to us, and we'll send you free printed copies of both of these handy programs for you to type in. We'll also include instructions on how to type in Gazette programs. Please enclose a self-addressed, stamped envelope. Send a self-addressed disk mailer with appropriate postage to receive these programs on disk.

Write to Typing Aids, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.



GEOS

Steve Vander Ark

POINTERS AND DRIVERS

A graphical user interface (GUI) such as GEOS handles routine commands with a pointer on the screen, which makes the computer a friendly place to work and play. Just point and click, and the computer leaps into action.

There has to be a link, however, between your thinking and the computer's high-powered magic. You need some way to move the pointer on the screen, some gadget that will translate your actions into electrical impulses the computer can understand. GEOS refers to these gadgets as input devices; you most likely refer to them as a mouse and joystick.

In order for GEOS to know how to interpret the signals from the device you're using, you need to provide it with a small bit of code called an input driver. You probably know that the input driver you install on your boot disk will be the one the system assumes you're using when it boots.

You probably also know that you can switch from one input driver to another from the deskTop with an option on the GEOS menu. The joystick and the mouse aren't the only input devices around, however. GEOS 64 has drivers for two other popular gadgets: the light pen and the KoalaPad. For another thing, the drivers you get with GEOS aren't the only ones available—and aren't necessarily the best ones either.

As far as devices go, the best known are the mouse, the joystick, the Inkwell light pen, and the KoalaPad graphics tablet. Each device has its strong points.

The joystick is particularly well suited for games. Also, the Suncom Icontroller, a small joystick that attaches to

the side of your 128 or 64, lets you keep your hands near the keyboard while working; this is handy while using geoWrite.

The mouse is perhaps the most versatile of the bunch; its proportional movement (in other words, the fact that it speeds up as it moves) makes it superior for maneuvering around the GEOS screen. Since the mouse is held roughly the same way a pen or pencil is held—in one hand and moved about on a flat surface—it's very easy to use for graphics in geoPaint or for object placement in geoPublish.

If a natural drawing posture is what you're after, though, the light pen is a logical choice. You hold it like a pen, obviously, and actually draw on the screen with it. For some drawing tasks, the light pen is perfect. Freehand artwork using the spline tool in geoPublish is a good example. On the downside, you have to hold your hand up to the screen all the while.

With the KoalaPad, you hold the stylus exactly like a real pen. Since you hold the writing surface with your other hand, this device gives the best combination of intuitive use and comfortable posture. Device drivers for both the light pen and the KoalaPad are included only with the 64 version of GEOS, however.

These official drivers for the pen and pad are far from perfect. For one thing, the light pen driver reads the button click from the button on the pen itself. This is fine for drop-down menus, but if you're positioning graphics or trying to hold the end of a spline in place, you can't press the button without serious jiggling. This makes using the pen for graphics virtually impossible.

Q-Link has a solution in the form of an alternate driver called PenJoy (filename: PENJOY, uploaded by Mystic

Jim). Instead of reading the button on the pen, PenJoy reads the button of a joystick plugged into port 2. Even with the best of alternative drivers, though, the response of the pen to the screen in GEOS is poor. The pen frequently misreads the screen, which in geoPaint results in stray and scribbly lines.

The problem with the KoalaPad driver is that it translates the position of your pen on the pad literally to a position on the screen. If you don't have the pointer "attached" to your pen position, such as when a drop-down menu opens and the pointer is arbitrarily placed on the first choice, you have to scratch around trying to snag the arrow's position with your stylus. Chances are you'll miss it or accidentally move it away from where you wanted it. The precision with which you can move the pointer is less than exact as well.

A new KoalaPad driver available on Q-Link addresses these problems; its filename is KOALA PAD III, uploaded by SYSOP PH).

There are input drivers available on Q-Link for the mouse and joystick as well. You can get mouse drivers that use port 2, that allow you to double-click only with the right button—not the left—and that switch your 128 into 2-MHz mode. You can also find drivers for Supersketch and the Atari trackball on Q-Link.

Which device is best? I've used them all with various drivers and in most applications, and I'll put my money on the mouse. There's simply no input device that works as smoothly and precisely or feels as natural as the mouse. It works better for freehand drawing than either the light pen or the KoalaPad, and it scoots you around the desk-top more quickly and efficiently than the joystick. □

For GEOS to interpret the signals from your input device, you need to provide it with a bit of code called an input driver.

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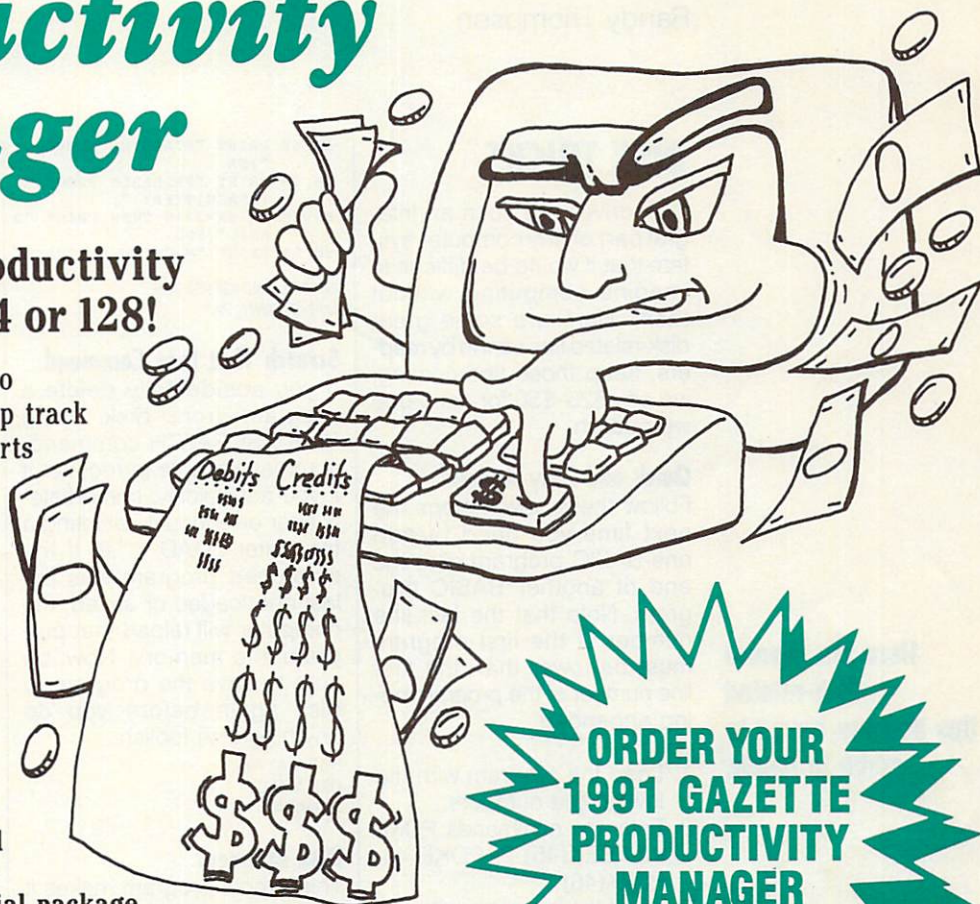
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PROGRAMMER'S PAGE

Randy Thompson

DISK TRICKS

Disk drives are such an integral part of any computer system that it would be difficult to imagine computing without them. Here are some great disk-related tips sent in by readers. Keep those tips coming; we pay \$25-\$50 for each one we publish.

Quick and Easy Append

Follow these seven steps the next time you need to add one BASIC program onto the end of another BASIC program. Note that the last line number of the first program must be lower than the first line number of the program being appended.

1. Load the program with the lowest line numbers.
2. Enter the commands POKE 43,PEEK(45)-2: POKE 44,PEEK(46)
3. Load the program with the highest line numbers.
4. Enter the commands POKE 43,1: POKE 44,8
5. Enter LIST to check your new, larger program.
6. If you get an OVERFLOW error message, enter a do-nothing line, such as 0 REM
7. Save your new program.

HELEN ROTH
LOS ANGELES, CA

What's Your Address?

The following program asks for the filename of a machine language program and then tells you where that program loads into memory. This is important information when you forget a program's SYS address because the address in which a program loads is usually its SYS address, too.

```
RB 10 INPUT "FILENAME";FS
RA 20 OPEN 8,8,FS+";P,R"
SC 30 GET#8,LB$,HB$
CR 40 CLOSE 8
KH 50 HB=ASC(HB$+CHR$(0)):LB=A
    SC(LB$+CHR$(0)):SA=HB*25
    6+LB
```

```
JA 60 PRINT "STARTING ADDRESS: ";SA
QH 70 PRINT "PROBABLE PROGRAM (SPACE)TYPE: ";
FS 80 IF SA=2049 THEN PRINT "BASIC":END
SM 90 PRINT "MACHINE LANGUAGE"
```

JOHN L. BERGERSHIRE
MANSTOWN, PA

Scratch That Last Command

If you accidentally delete a program from disk using DOS's SCRATCH command, you may be able to recover it if you act quickly. Immediately after erroneously deleting a file, enter LOAD "*",8. If the scratched program was the last one loaded or saved, the computer will reload that program into memory. Now, be sure to save the program to disk again before you do anything else foolish.

ROB MAXWELL
DELTA, B.C.
CANADA

Disk Manager

This simple program makes it easier to format disks and rename and delete files. Choose the desired menu option and answer the prompts.

```
KP 10 PRINT "{CLR}{RVS}
    {6 SPACES}DISK MANAGER -
    BRAD SCHULTZ{7 SPACES}"
    :PRINT:PRINT
KK 20 PRINT:PRINT "{2 SPACES}
    {RVS}1{OFF} RENAME FILE"
GH 30 PRINT:PRINT "{2 SPACES}
    {RVS}2{OFF} DELETE FILE"
GS 40 PRINT:PRINT "{2 SPACES}
    {RVS}3{OFF} FORMAT DISK"
GJ 50 PRINT:PRINT "{2 SPACES}
    {RVS}4{OFF} EXIT PROGRAM
    "
KS 60 PRINT:PRINT "ENTER YOUR
    {SPACE}CHOICE: ";
SS 70 GET KS:IF KS<"1" OR KS>"4" THEN 70
JJ 80 PRINT KS:PRINT:PRINT:ON
    {SPACE}VAL(KS) GOSUB 100
    ,200,300,400
AF 90 GOTO 10
PF 100 REM RENAME FILE
MJ 110 INPUT "OLD FILENAME";OF
    $:IF OF$="" GOTO 160
FG 120 INPUT "NEW FILENAME";NF
    $:IF NF$="" GOTO 160
MD 130 OPEN 15,8,15
XF 140 PRINT#15,"R0:";NF$;" ";
    OF$
FF 150 CLOSE 15
KA 160 RETURN
FQ 200 REM DELETE FILE
MS 210 INPUT "DELETE WHICH FILE";
    DF$:IF DF$="" GOTO 2
    50
BK 220 OPEN 15,8,15
DE 230 PRINT#15,"S0:";DF$
MP 240 CLOSE 15
```

```
SG 250 RETURN
GK 300 REM FORMAT DISK
PC 310 INPUT "DISK NAME";DNS:I
    F DNS$="" GOTO 370
CH 320 PRINT "PLACE DISK TO BE
    FORMATTED INTO DRIVE 8
    AND PRESS A KEY"
XA 330 GET KS:IF KS="" GOTO 33
    0
PB 340 OPEN 15,8,15
XM 350 PRINT#15,"N0:";DNS$;"BS
    "
SD 360 CLOSE 15
DR 370 RETURN
KS 400 REM EXIT PROGRAM
DR 410 PRINT "{CLR}":END
```

BRAD SCHULTZ
APPLETON, WI

Quick-Load Classic

Here's a classic load-and-run tip that's been around the disk block a few times, but it's so useful it bears repeating. Instead of entering a LOAD command, waiting for the designated program to load, and then typing RUN, try typing LOAD "program",8: and then pressing Shift-Run/Stop. As soon as you do, LOAD appears on the screen, and your program automatically loads and runs. You don't even have to press the Return key.

KEVIN REEVES
GROTON, CT

Vital Statistics

The BASIC code listed below allows you to determine a disk's vital statistics. You can determine the disk's name, ID, and number of free and used disk blocks from within a program without listing the disk's entire directory. The entire process takes three seconds or less.

```
FJ 10 SYS 57812"S0",8,0:POKE 7
    80,0:POKE 781,0:POKE 782
    ,207:SYS 65493
SM 20 BF=PEEK(53025)*256+PEEK(
    53024):BU=664-BF
EB 30 SS=52998:FS$=""GOSUB 10
    0:DNS$=FS$
KX 40 ID$=CHR$(PEEK(53016))+CH
    R$(PEEK(53017))
DH 50 PRINT "DISK NAME: ";DNS$
DE 60 PRINT "DISK ID: ";ID$
XJ 70 PRINT "BLOCKS USED:";BU
MD 80 PRINT "BLOCKS FREE:";BF
ME 90 END
HF 100 SC=PEEK(SS):IF SC=160 O
    R SC=34 THEN RETURN
RD 110 FS$=FS$+CHR$(SC):SS=SS+
    1:GOTO 100
```

CAMERON KAISER
LA MESA, CA

Here are several
disk-related
tips that are bound to
come in handy.

DRIXELLA'S DILEMMA

By Arthur Moore

Drixella's Dilemma is a game with deceptively simple rules, but it's a game that requires strategic planning. It's played on a 64 with one joystick.

The evil witch Drixella has taken you hostage. All is not lost, however; she dangles before you one chance for freedom. "Here you will remain," she shouts with a booming voice, "until you solve the puzzle!" The door slams shut, and her chilling laughter fades into silence.

You notice a clay board in a corner that consists of 96 squares, 12 across and 8 vertical. Nearby are a scroll and small velvet pouch. Opening the scroll, you see faint writing. You begin to read.

"Herein are 72 tiles that have been painted six different colors. On them are six different icons that represent the realm of witchcraft: broom, cauldron, beetle, black cat, crow, and Drixella's hat.

"Your goal is to place all 72 tiles on the playing board. The first 6 have been placed for you. To complete the task, you must follow these five rules.

- "1. Tiles are taken out one at a time.
- "2. To play a tile, you must place it next to an occupied square. Diagonals aren't included.
- "3. Surrounding tiles must match the played tile in either color or icon.
- "4. If a played tile touches more than one other, the matches must balance. If two tiles are adjacent, one must match by color and the other by icon. If three should border, two must have the same color or icon, and the other must match in icon or color. If four should border, then there must be two color matches and two icon matches.
- "5. You must play a tile before the timer runs out. After each play, the timer will be reset and will run a bit faster."

"Simple enough," you say to yourself. "I'll just play all the tiles, and I'll go free!" Little do you realize that this is the first of many days that you'll spend pondering Drixella's Dilemma.

Entering the Program

Drixella's Dilemma is written entirely in machine language. To enter it, use MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts, re-

spond with the following values.

Starting address: 0801

Ending address: 1608

Be sure to save a copy of the program before you exit MLX.

Taking Control

Use a joystick in port 2 to play. Move the flashing cursor to the desired square and press the button to put the tile at the right on the playing board. A buzz indicates an illegal move, and the explanation will be highlighted below. Your timer ticks down at the left of the board. Scoring is based upon the number of adjacent tiles. One adjacent tile earns 10 points, two tiles earn 30 points, three tiles earn 90 points, and four tiles earn 200 points.

The plus sign (+) beneath your score counts the number of four-way combinations you have completed. These are tiles with all four adjacent squares occupied at the time of playing. These mark the gauge of a true champion.

Practice, Practice

At the title screen, you have the option of playing either a scored game as described above or a no-pressure practice game. In the latter mode, a timer won't be used, allowing you time to concentrate on every move. Score isn't tallied in practice.

You also have an undo key in practice mode. By pressing f1, you can take back your previous move. All moves are recorded, so you may undo as many as you wish. Of course, this action is frowned upon, and your computer will taunt a bit. In a practice game, you simply make as many moves as you can.

During actual play, the game will end should the timer run out before you make a move. Pressing f7 while playing either mode will return you to the title screen.

Hints

Go for points early. Look for moves that border more than one tile. This will free up moves when the board fills and moves become scarce.

Don't group too many of the same color in one area. Likewise, don't

group too many of the same icon in one area. This will make it difficult to make moves with multiple borders.

DRIXELLA'S DILEMMA

```

0801:0C 08 C8 07 9E 20 32 30 AC
0809:36 33 00 00 00 00 20 8D CE
0811:10 20 F1 08 20 0B 0A A9 DA
0819:A4 85 FB 85 FD A9 04 85 D8
0821:FC A9 D8 85 FE 20 C9 0A A3
0829:A9 6E 8D 54 15 A9 00 8D 7D
0831:8A 02 8D 59 15 8D 58 15 F2
0839:AD 0E 16 C9 48 D0 03 4C DA
0841:10 10 20 14 0C AD 53 15 75
0849:F0 06 20 37 0F CE 54 15 3C
0851:EE 27 D0 AD 53 15 F0 0B 73
0859:20 4F 0F AD 55 15 F0 03 ED
0861:4C F6 0F AE 54 15 A0 FF 5A
0869:88 D0 FD CA D0 F8 AD 00 24
0871:DC 29 0F 49 0F D0 34 20 F4
0879:E4 FF C9 88 F0 90 C9 85 A0
0881:D0 12 AD 53 15 D0 0D 4C BB
0889:11 0E A9 13 20 D2 FF A9 02
0891:00 85 C6 60 AD 00 DC 29 32
0899:10 D0 B5 20 32 0C AD 16 D1
08A1:16 30 AD F0 93 20 7B 0F B0
08A9:4C 51 08 C9 01 F0 19 C9 99
08B1:02 F0 22 C9 04 F0 2B C9 E3
08B9:08 D0 95 AD 0A 16 C9 0C D7
08C1:F0 8E 20 9C B0 4C 51 08 EF
08C9:AD F5 16 C9 01 F0 81 20 C1
08D1:F5 0B 4C 51 08 AD 0B 16 61
08D9:C9 08 F0 10 20 D6 0B 4C AE
08E1:51 08 AD 0A 16 C9 01 F0 BD
08E9:03 20 B7 08 4C 51 08 60 43
08F1:AD 11 D0 29 EF 8D 11 D0 72
08F9:A2 3F BD B4 13 9D C0 37 F5
0901:A9 FF 9D 80 03 BD F3 13 AD
0909:9D 40 03 BD 33 14 9D C0 1C
0911:02 CA 10 E6 A2 07 BD 73 67
0919:14 9D F8 07 BD 7B 14 9D CD
0921:27 D0 CA 10 F1 A2 0F BD 4B
0929:83 14 9D 00 D0 CA 10 F7 7F
0931:A2 FF AD 53 15 D0 02 A2 12
0939:1F 8E 15 D0 A2 06 8E 17 8F
0941:D0 8E 1B D0 8E 10 D0 A9 CF
0949:7F 8D 0D DC A5 01 29 FB 6D
0951:85 01 A9 00 85 F9 85 FB B6
0959:85 FD A9 D0 85 FA A9 E0 3C
0961:85 FC A9 38 85 FE A5 FB 9D
0969:38 E5 F9 A8 A5 FC E5 FA C2
0971:AA A5 FA C5 FE 90 08 D0 19
0979:30 A5 F9 C5 FD B0 2A 8A 3A
0981:18 65 FE 85 FE 98 38 E5 E1
0989:FB F0 09 90 02 C6 FC 49 6E
0991:FF 18 69 01 85 FB E8 B1 86
0999:FB 91 FD 88 C0 FF D0 F7 F5
09A1:C6 FC C6 FE CA D0 F0 F0 8B
09A9:2A 98 18 65 F9 85 F9 B0 DA
09B1:02 C6 FA 98 18 65 FD 85 37
09B9:FD B0 02 C6 FE E8 98 49 B9
09C1:FF A8 C8 F0 07 B1 F9 91 AA
09C9:FD C8 D0 F9 E6 FE E6 FA C2
09D1:CA D0 F2 A5 01 09 04 85 EF
09D9:01 A9 81 8D 0D DC A2 5F 60
09E1:BD 93 14 9D 08 3A BD F3 AC
09E9:14 9D 08 3B CA 10 F1 A9 46
09F1:FE A2 07 9D 38 3F E0 07 6E
    
```


PROGRAMS

```

09F9:F0 03 9D D0 3F CA 10 F3 3F
0A01:E8 8E D7 3F A9 1F 8D 18 19
0A09:D0 60 A9 0F 85 B5 A9 01 1B
0A11:8D 0A 16 8D 0B 16 A9 93 A1
0A19:20 D2 FF A9 0D A2 04 20 A7
0A21:D2 FF CA D0 FA A9 00 8D 11
0A29:20 D0 8D 21 D0 8D 0E 16 34
0A31:20 AC 0A A9 04 8D 86 02 C1
0A39:A2 0C 20 B7 0A CA D0 FA 39
0A41:A9 0D 20 D2 FF 20 D2 FF C4
0A49:A0 06 20 AC 0A A9 04 8D 8A
0A51:86 02 20 B7 0A A9 07 8D 3B
0A59:86 02 A2 0A 20 B7 0A CA E4
0A61:D0 FA A9 04 8D 86 02 20 BC
0A69:B7 0A A9 0D 20 D2 FF 20 4E
0A71:D2 FF 88 D0 D5 20 AC 0A 9F
0A79:A9 04 8D 86 02 A2 0C 20 50
0A81:B7 0A CA D0 FA AD 11 D0 DB
0A89:09 10 8D 11 D0 A9 FC A0 B0
0A91:12 20 1E AB A9 BD A0 12 CC
0A99:20 1E AB A2 15 A0 06 18 34
0AA1:20 F0 FF A9 6B A0 13 20 C0
0AA9:1E AB 60 A2 04 A9 20 20 15
0AB1:D2 FF CA D0 FA 60 48 8A 0A
0AB9:48 98 48 A9 F1 A0 12 20 12
0AC1:1E AB 68 A8 68 AA 68 60 86
0AC9:A9 80 A2 8C CA 9D A7 16 22
0AD1:D0 FA A2 47 A9 06 38 E9 95
0AD9:01 A0 0C 9D 17 16 CA 30 C8
0AE1:05 88 D0 F7 10 F0 A2 47 05
0AE9:A0 05 98 0A 0A 0A 1D EC
0AF1:17 16 9D 17 16 CA 30 05 7D
0AF9:88 10 EF 30 EB A2 05 A0 EB
0B01:0D BD 17 16 48 B9 17 16 BE
0B09:0D 17 16 68 99 17 16 98 EA
0B11:18 69 0D A8 CA D0 EA A2 CB
0B19:FF 86 02 20 E1 0C A2 0B A2
0B21:20 9C 0B CA D0 FA 20 E1 11
0B29:0C A2 07 20 D6 0B CA D0 1A
0B31:FA 20 E1 0C A2 0B 20 B7 03
0B39:0B CA D0 FA 20 E1 0C A2 94
0B41:04 20 F5 0B CA D0 FA A2 03
0B49:05 20 9C 0B CA D0 FA 20 DD
0B51:E1 0C 20 9C 0B 20 D6 0B BA
0B59:20 E1 0C 20 F5 0B A2 04 A0
0B61:A0 1E 18 20 F0 FF A0 15 32
0B69:A9 6B 20 1E AB E6 02 A9 BB
0B71:80 8D 18 D4 8D 0E D4 8D 57
0B79:0F D4 8D 12 D4 A2 41 AD 80
0B81:1B D4 29 7F C9 41 B0 F7 24
0B89:A8 B9 1D 16 48 BD 1D 16 F0
0B91:99 1D 16 68 9D 1D 16 CA 5D
0B99:10 E5 60 EE 0A 16 E6 FB 9E
0BA1:D0 02 E6 FC E6 FB D0 02 18
0BA9:E6 FC E6 B5 AD 00 D0 18 D1
0BB1:69 10 8D 0B D0 60 CE 0A E1
0BB9:16 A5 FB D0 02 C6 FC C6 BC
0BC1:FB A5 FB D0 02 C6 FC C6 B7
0BC9:FB C6 B5 AD 00 D0 38 E9 BE
0BD1:10 8D 00 D0 60 EE 0B 16 4B
0BD9:A5 FB 18 69 50 85 FB 90 7C
0BE1:02 E6 FC A5 B5 18 69 0E 9B
0BE9:85 B5 AD 01 D0 18 69 10 BF
0BF1:8D 01 D0 60 CE 0B 16 A5 AD
0BF9:F6 38 E9 50 85 FB B0 02 D3
0C01:CB FC A5 B5 38 E9 0E 85 D6
0C09:B5 AD 01 D0 38 E9 10 8D AB
0C11:01 D0 60 A5 FB 48 A5 FC 8D
0C19:48 A9 00 85 FB A9 06 85 30
0C21:FC AE 0E 16 BD 17 16 20 1D
0C29:90 0D 68 85 FC 68 85 FB C2
0C31:60 A9 FF 8D 16 16 A4 B5 C4
0C39:B9 A7 16 30 01 60 EE 16 5B
0C41:16 AC 0E 16 B9 17 16 48 51
0C49:29 0F 8D 10 16 68 29 F0 02
0C51:8D 0F 16 A9 04 8D 11 16 DF
0C59:A9 00 8D 13 16 8D 14 16 4E
0C61:A4 B5 B9 A8 16 20 D1 0D DC
0C69:B9 A6 16 20 D1 0D B9 B5 B8
0C71:16 20 D1 0D B9 99 16 20 28
0C79:D1 0D AD 11 16 D0 06 A9 2E
0C81:01 8D 16 16 60 AD 14 16 99
0C89:CD 13 16 D0 0A C9 00 D0 65
0C91:4F A9 02 8D 16 16 60 AD 4C
0C99:11 16 C9 03 D0 22 AD 13 A6
0CA1:16 C9 03 D0 0A AD 14 16 E9
0CA9:C9 01 D0 14 4C E1 0C AD F1
0CB1:14 16 C9 03 D0 0A AD 13 DF
0CB9:16 C9 01 D0 03 4C E1 0C 95
0CC1:AD 14 16 CD 13 16 90 07 6E
0CC9:38 ED 13 16 4C D7 0C AD C4
0CD1:13 16 38 ED 14 16 C9 01 6C
0CD9:F0 06 A9 03 8D 16 16 60 AD
0CE1:AD 53 15 F0 28 AE 11 16 8B
0CE9:18 BD 66 15 6D 59 15 8D 24
0CF1:59 15 90 03 EE 58 15 A0 E1
0CF9:1E A2 04 18 20 F0 FF A9 3A
0D01:01 8D 86 02 AD 58 15 AE 97
0D09:59 15 20 CD BD AE 0E 16 D0
0D11:A5 B5 9D 5F 16 A8 BD 17 FA
0D19:16 99 A7 16 20 90 0D EE 47
0D21:0E 16 A5 02 30 3F A9 0F 7D
0D29:8D 18 D4 A9 64 8D 0D 73
0D31:8D 05 D4 A9 32 8D 01 D4 27
0D39:A9 24 8D 06 D4 A9 21 8D 60
0D41:04 D4 A2 32 A0 00 88 D0 F0
0D49:FD CA D0 FA A9 10 8D 04 8B
0D51:D4 A2 32 A0 00 88 D0 FD 90
0D59:CA D0 FA AD 11 16 C9 04 BF
0D61:D0 03 20 9E 0E A9 01 8D 39
0D69:86 02 A9 0D 20 D2 FF A0 3A
0D71:20 A2 12 18 20 F0 FF A9 76
0D79:48 38 ED 0E 16 C9 0A B0 01
0D81:07 48 A9 30 20 D2 FF 68 1E
0D89:AA A9 00 20 CD BD 60 A0 2C
0D91:00 48 29 0F 0A 18 69 41 98
0D99:91 FB 69 01 C8 91 FB A0 DD
0DA1:28 69 1F 91 FB 69 01 C8 77
0DA9:91 FB A5 FB 85 FD A5 FC 6C
0DB1:18 69 D4 85 FE 68 29 F0 02
0DB9:4A 4A 4A AA BD B7 12 47
0DC1:A0 00 91 FD A0 28 91 FD 05
0DC9:C8 91 FD A0 01 91 FD 60 21
0DD1:10 06 CE 11 16 4C 10 0E 70
0DD9:8D 15 16 29 F0 48 A9 00 51
0DE1:8D 12 16 68 CD 0F 16 D0 38
0DE9:06 EE 13 16 EE 12 16 AD 20
0DF1:15 16 29 0F CD 10 16 D0 DD
0DF9:06 EE 14 16 EE 12 16 48 EA
0E01:AD 12 16 D0 09 68 68 68 6B
0E09:A9 02 8D 16 16 60 68 60 F0
0E11:AE 0E 16 E0 06 D0 03 4C 9E
0E19:51 08 CA 8E 0E 16 BD 5F C5
0E21:16 A8 A9 80 99 A7 16 98 DF
0E29:A2 07 8E 86 02 C9 1D 90 94
0E31:15 C9 6E B0 11 02 05 DD 1E
0E39:5A 15 F0 0A DD 60 15 F0 12
0E41:05 CA 10 F3 30 05 A2 04 B2
0E49:8E 86 02 A2 02 C9 0E 90 9C
0E51:08 E8 E8 38 E9 0E 4C 4E BA
0E59:0E 0A A8 C8 C8 18 20 F0 78
0E61:FF 20 B7 0A 20 66 0D A9 7B
0E69:64 8D 00 D4 8D 05 D4 A9 3C
0E71:28 8D 01 D4 A9 24 8D 06 71
0E79:D4 A9 81 8D 04 D4 A2 78 A4
0E81:A0 00 88 D0 FD CA D0 FA C3
0E89:8E 04 D4 A0 1E A2 09 18 38
0E91:20 F0 FF A9 7D A0 12 20 47
0E99:1E AB 4C 39 08 CE 15 D0 43
0EA1:CE 00 D0 A2 03 CE 00 D0 8D
0EA9:CE 01 D0 CA D0 F7 A9 00 ED
0EB1:A2 03 9D 06 D0 CA 10 FA C0
0EB9:8D 0C 16 8D 0D 16 AD 0C 63
0EC1:16 D0 14 AE 06 D0 EC 00 D7
0EC9:D0 F0 09 EE 06 D0 EE 08 F3
0ED1:D0 4C D8 0E EE 0C 16 AD E6
0ED9:0D 16 D0 14 AE 07 D0 EC 7D
0EE1:01 D0 F0 09 EE 07 D0 EE 85
0EE9:09 D0 4C F1 0E EE 0D 16 C3
0EF1:A0 0A A2 FF CA D0 FD 88 53
0EF9:D0 F8 AD 0C 16 F0 BF AD D4
0F01:0D 16 F0 D3 A0 C8 A2 FF F3
0F09:CA D0 FD 88 D0 F8 AD 53 22
0F11:15 F0 03 EE 11 05 EE 15 D4
0F19:D0 A9 00 A2 03 9D 06 D0 9F
0F21:CA 10 FA AD 00 D0 18 69 BF
0F29:04 8D 00 D0 AD 01 D0 18 E4
0F31:69 03 8D 01 D0 60 A9 FF E1
0F39:A2 BF 9D FF 36 CA D0 FA C5
0F41:A9 15 8D 57 15 A9 00 8D 7D
0F49:56 15 8D 55 15 60 A9 00 5C
0F51:AE 56 15 9D 00 37 E8 9D 25
0F59:00 37 E8 9D 00 37 E8 8E 79
0F61:56 15 CE 57 15 D0 0F A9 F2
0F69:15 8D 57 15 E8 E0 C0 D0 CE
0F71:05 A9 01 8D 55 15 8E 56 E7
0F79:15 60 A9 0F 8D 18 D4 A9 80
0F81:2D 8D 05 D4 A9 A5 8D 06 8C
0F89:D4 A9 21 8D 04 D4 A9 39 49
0F91:8D 01 D4 A9 05 8D 00 D4 1F
0F99:A2 C8 A0 FF 88 D0 FD CA 9D
0FA1:D0 F8 A9 05 8D 01 D4 A2 8A
0FA9:64 A0 FF 88 D0 FD CA D0 8F
0FB1:F8 A9 00 8D 04 D4 A9 26 7C
0FB9:8D D4 0F A9 DB 8D DB 0F AD
0FC1:AE 16 16 18 A9 28 6D DA A4
0FC9:0F 8D DA 0F 90 03 EE DB 69
0FD1:0F CA D0 EF A2 15 A9 01 01
0FD9:9D FF FF CA 10 FA A9 06 39
0FE1:8D 15 16 A2 C8 A0 FF 88 4A
0FE9:D0 FD CA D0 F8 CE 15 16 99
0FF1:D0 F1 4C 9C 0A A2 04 8E B9
0FF9:16 16 20 7B 0F A2 02 A0 0C
1001:09 18 20 F0 FF A9 90 A0 27
1009:12 20 1E AB 4C 7C 10 A2 CF
1011:02 A0 0B 18 20 F0 FF A9 AB
1019:84 A0 12 20 1E AB A9 0F E9
1021:8D 18 D4 A9 11 8D 01 D4 D8
1029:A9 C3 8D 00 D4 A9 64 8D 64
1031:05 D4 A9 24 8D 06 D4 A9 58
1039:21 8D 04 D4 20 71 10 A2 A4
1041:20 8E 04 D4 20 71 10 A9 73
1049:21 8D 04 D4 20 71 10 8E A0
1051:04 D4 A9 1A 8D 01 D4 A9 43
1059:9C 8D 00 D4 A9 21 8D 04 69
1061:D4 20 71 10 20 71 10 20 2A
1069:71 10 8E 04 D4 4C 7C 10 39
1071:A2 C8 A0 00 88 D0 FD CA 77
1079:D0 FA 60 A9 A0 A0 12 20 33
1081:1E AB 20 E4 FF C9 88 D0 F6

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1089:F9 4C 0F 08 A9 00 8D 20 A4
1091:D0 8D 21 D0 8D 15 D0 A9 BA
1099:17 8D 18 D0 A2 FF E8 BD 5D
10A1:72 15 F0 17 C9 0A 90 06 6D
10A9:20 D2 FF 4C 9F 10 A8 E8 CA
10B1:BD 72 15 20 D2 FF E8 D0 6A
10B9:FA F0 E3 A2 01 A9 06 8D 82
10C1:DE 10 A9 16 8D DC 10 8A 76
10C9:48 A8 CE DE 10 AD DE 10 05
10D1:C9 FF D0 03 CE DC 10 88 B3
10D9:D0 F0 A0 00 A9 00 20 1E 5E
10E1:AB A9 91 20 D2 FF A9 0D 6D
10E9:20 D2 FF 20 68 12 68 A8 D7
10F1:E8 E0 1C D0 C8 A2 09 8A BC
10F9:A8 18 69 11 8D 07 16 8A F1
1101:6D 07 16 8D 07 16 B9 E1 1D
1109:15 20 D2 FF C8 CC 07 16 B5
1111:90 F4 A9 91 20 D2 FF A9 FC
1119:0D 20 D2 FF 20 68 12 CA B5
1121:D0 D5 A2 02 8A 4A 8D 07 35
1129:16 A9 1D 20 D2 FF CE 07 A1
1131:16 D0 F8 8E 07 16 A9 12 90
1139:38 ED 07 16 8D 07 16 A0 8A
1141:00 B9 E2 15 20 D2 FF C8 94
1149:CC 07 16 D0 F4 A9 91 20 F4
1151:D2 FF A9 0D 20 D2 FF 20 4F
1159:68 12 E8 E8 E0 12 D0 C4 95
1161:A2 14 20 68 12 20 E4 FF 3F
1169:C9 85 F0 0A C9 86 F0 10 EA
1171:CA D0 EF 4C A1 11 A9 01 95
1179:8D 53 15 A2 0A 4C 88 11 A7
1181:A9 00 8D 53 15 A2 10 A0 53
1189:01 18 20 F0 FF A9 1C 20 44
1191:D2 FF A9 BA 20 D2 FF A2 EC
1199:32 20 68 12 CA D0 FA 60 FA
11A1:A2 01 8A 48 8E 07 16 A9 91
11A9:1B 38 ED 07 16 A8 A9 1D 59
11B1:20 D2 FF 88 D0 FA A0 16 EA
11B9:0E 07 16 CE 07 16 A9 06 3E
11C1:38 ED 07 16 B0 01 88 20 78
11C9:1E AB A9 91 20 D2 FF A9 2A
11D1:0D 20 D2 FF 20 68 12 68 0C
11D9:AA E8 E0 C0 D0 C4 A2 01 48
11E1:8E 07 16 A9 0F 38 ED 07 A6
11E9:16 A8 A9 1D 20 D2 FF 88 1D
11F1:D0 FA 0E 07 16 A9 0D 38 17
11F9:ED 07 16 A8 8A 18 69 18 C1
1201:8D 08 16 A9 01 8D 09 16 B1
1209:B9 E2 15 20 D2 FF C8 CE 5E
1211:08 16 D0 F4 A9 91 20 D2 CE
1219:FF A9 0D 20 D2 FF 20 68 8A
1221:12 E8 E0 07 D0 BA A2 02 CD
1229:8A 18 69 07 A8 8D 07 16 D5
1231:A9 1D 20 D2 FF 88 D0 FA 61
1239:8E 07 16 A9 1F 38 ED 07 80
1241:16 8D 07 16 A0 00 B9 E2 71
1249:15 20 D2 FF C8 CC 07 16 F7
1251:D0 F4 A9 91 20 D2 FF A9 5F
1259:0D 20 D2 FF 20 68 12 E8 16
1261:E0 1F D0 C4 4C BC 10 A9 43
1269:0F 8D 08 16 A9 FF 8D 09 4C
1271:16 CE 09 16 D0 FF CE 08 F2
1279:16 D0 F1 60 05 43 48 05 2C
1281:41 54 00 05 43 4F 4E 47 E6
1289:52 41 54 53 21 0D 00 05 29
1291:2A 20 47 41 4D 45 20 4F DE
1299:56 45 52 20 2A 0D 00 1D 29
12A1:1D 1D 1D 1D 1D 1D 1D C5
12A9:46 37 20 54 4F 20 52 45 EC
12B1:53 54 41 52 54 00 01 03 89
12B9:05 06 02 0C 81 13 0D 20 75
12C1:20 20 20 20 20 44 52 60
12C9:49 58 45 4C 4C 41 27 53 1F
12D1:20 95 44 49 4C 45 4D 4D E7
12D9:41 20 20 20 20 20 11 7F
12E1:11 11 11 11 05 12 BE 92 86
12E9:BB 30 11 9D 9D 9D BC 00 D0
12F1:12 20 E7 9D 9D 11 E4 BA B3
12F9:91 92 00 11 1D 1D 1D 51
1301:91 91 91 91 91 91 91 27
1309:91 AF AF 11 9D 9D 9D 12 9B
1311:BE A4 A4 BC 11 9D 9D 9D F7
1319:9D 9D 92 B6 12 A7 1D 1D B9
1321:20 92 B5 11 9D 9D 9D FF
1329:9D 9D B6 12 A7 1D 1D 20 89
1331:92 B5 11 9D 9D 9D 9D 46
1339:12 BB 20 20 AC 92 11 9D CC
1341:9D 9D B7 B7 11 9D 9D 9D E7
1349:05 4C 45 46 54 9F 11 9D F2
1351:9D 9D 9D B0 C0 C0 AE 11 E3
1359:9D 9D 9D 9D 7D 20 7D 6D
1361:11 9D 9D 9D 9D AD C0 EA
1369:BD 00 97 20 20 4E 4F 20 5C
1371:41 44 4A 41 43 45 4E 54 C6
1379:2D 54 49 4C 45 0D 1D 1D 68
1381:10 1D 1D 1D 20 54 49 4C 24
1389:45 53 20 44 4F 20 4E 4F 56
1391:54 20 4D 41 54 43 48 0D F4
1399:1D 1D 1D 1D 1D 1D 43 3E
13A1:4C 4F 52 2F 49 43 4F 4E 43
13A9:20 49 4D 42 41 4C 41 4E 0C
13B1:43 45 00 00 00 00 00 00 CA
13B9:00 00 00 00 00 07 E0 00 8A3
13C1:10 00 13 C8 00 14 28 00 7F
13C9:15 A8 00 15 A8 00 14 28 8B
13D1:00 13 C8 00 10 00 07 5D
13D9:E0 00 00 00 00 00 00 70
13E1:00 00 00 00 00 00 00 08
13E9:00 00 00 00 00 00 00 10
13F1:00 00 00 10 00 00 00 19
13F9:00 00 00 00 00 00 00 20
1401:00 00 10 00 00 10 00 6B
1409:38 00 00 28 00 00 C6 00 5D
1411:43 83 84 00 C6 00 00 28 AA
1419:00 00 38 00 00 10 00 88
1421:10 00 00 00 00 00 00 51
1429:00 00 00 00 00 00 10 61
1431:00 70 00 28 00 00 10 18
1439:00 00 00 00 10 00 00 38 1A
1441:00 00 28 00 00 6C 00 00 20
1449:44 00 01 C7 00 47 01 C4 14
1451:AC 00 6A 47 01 C4 01 C7 76
1459:00 00 44 00 00 6C 00 00 BB
1461:28 00 00 38 00 00 10 00 41
1469:00 00 00 00 10 00 00 28 3A
1471:00 48 DF 0E 0E 0E 0E 22
1479:DD DC 0F 02 02 08 0E 02 36
1481:02 02 38 52 06 4B 1A 4B 34
1489:00 00 00 00 18 BC 18 A7 3D
1491:18 92 7F F3 E9 C1 F1 E0 B4
1499:E0 E0 FC FE FE FE FE 7E 6A
14A1:3E 1E 7F FE E7 CF 98 C0 D0
14A9:F0 C0 FC FE CE E6 32 06 86
14B1:1E 06 7F FF FB F0 F8 FC EC
14B9:FC F8 FC FE BE 1E 3E 7E 97
14C1:7E 3E 7F FE FF F0 EE 0E 2D
14C9:E8 E7 FC FE FE 1E EE 0E 4C
14D1:2E CE 7F FF FF FF FF FF B4
14D9:FE FC FC FE E6 CE 9E 3E 3E
14E1:7E FE 7F FF FE FE FE FC EF
14E9:FC F8 FC FE FE FE FE 7E CE
14F1:7E 3E F0 F8 F8 F4 ED C0 CE
14F9:7F 00 0E 0E 06 12 8A CE E0
1501:FC 00 F0 C0 98 CF E7 FF A7
1509:7F 00 1E 06 32 E6 CE FE E0
1511:FC 00 F0 E1 E2 E0 F1 F9 6E
1519:7F 00 1E 0E 8E 8E 1E 3E D0
1521:FC 00 E0 E0 F0 EE FF FF 37
1529:7F 00 0E 0E 1E EE FE FE 5F
1531:FC 00 E1 D1 A9 D5 EB F7 A7
1539:7F 00 FE FE FE FE FE FE E3
1541:FC 00 FB FE F3 C0 FF FF FB
1549:7F 00 BE FE 9E 06 FE FE 05
1551:FC 00 00 6E 00 00 00 00 E0
1559:00 1D 2B 39 47 55 63 1A 34
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1571:00 93 01 05 07 0D 0E D3 4D
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1591:4D 50 54 20 54 4F 20 53 76
1599:4F 4C 56 45 20 54 48 45 C5
15A1:20 50 55 5A 5A 4C 45 3F 0E
15A9:03 0D 08 20 07 20 01 05 5B
15B1:2D 20 4F 52 20 2D 03 0D 52
15B9:03 20 9E 46 33 20 2D 20 3A
15C1:50 4C 41 59 20 41 20 4E 79
15C9:4F 2D 50 52 45 53 53 55 89
15D1:52 45 20 50 52 41 43 54 F1
15D9:49 43 45 3F 13 0D 01 05 E9
15E1:00 20 C4 20 52 20 49 20 74
15E9:58 20 45 20 4C 20 4C 20 8E
15F1:41 20 27 20 53 20 20 20 27
15F9:C4 20 49 20 4C 20 45 20 47
1601:4D 20 4D 20 41 00 00 00 91

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Arthur Moore is the author of *Sammy Seal* (February/March 1992). He says he still enjoys his 64 and 128 after eight years of use. He lives in Orlando, Florida.

CHARACTER DESIGNER

By Daniel Lightner

Character Designer is a utility program that lets you create your own characters and set up animation sequences. CD also has an 80 x 64 pixel sketch pad that lets you create designs, characters, or pictures. You can then place these items in a sequential file for use elsewhere. You can also place character shapes on this pad to help you set up programmed character displays.

Entering the Program

Character Designer is written entirely in machine language. To enter the program, use MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following.

PROGRAMS

Starting address: 0801

Ending address: 1B68

Be sure to save a copy of the program before you exit MLX.

Running the Program

Character Designer loads and runs like a BASIC program. To move the pointer, use a joystick in port 2 or use the keyboard cursor keys.

Workscreen

You'll notice that CD's screen is divided into various sections, with copyright information in the upper right-hand corner. Clear this window and start the program by pressing the space bar.

At the top left side of the screen there's a small square sprite; this is the program's pointer. First, let's move it down the screen to near the bottom where you can see Commodore's standard uppercase graphic character set. Press the fire button if you're using a joystick; otherwise, press f7 as you cursor along the alphabet. Watch the editing window in the upper left corner of the screen. These rows of characters are where you pick up characters for editing simply by pressing the fire button or f7. Notice that this window extends upward at a point near the center.

Edit a Character

Use the above steps to find the up-arrow Δ character and place it in the editing window. Be sure to release the fire button when you see the character in the window.

Move the pointer back to the area labeled as the editing window. This area is divided into three parts. On the left is the window that contains the pixel patterns for the character being edited.

The center window contains an options menu. Notice that each item in this menu is preceded by a round dot. Place the pointer on a dot when you wish to choose one of these options. Move to one of the items on the menu and press the fire button or f7. Experiment with all of the options.

Notice the window to the right as you enter the different options. This window contains six rows of the selected character and displays four more characters below separated by spaces. This display lets you see exactly what

the edited character looks like as soon as you make any changes.

Now press the D key and look at the Edit window. This is the character's data. Now press the space bar.

Next move the pointer back into the window that contains the pixel patterns and press the Clr/Home key. The window should clear. Press the fire button and watch what happens to the pixel under the pointer. If you continue to hold the fire button, the pixel will toggle back off again. Remember, if you're using the keyboard, function key f7 is the same as the fire button.

Using the Buffer

Now edit a character or create one of your own. When you have finished, move over to the window that contains the six rows of characters and press the fire button. Look in the Buffer window. It should now contain the same image as the Edit window.

If you create another character or pick one up out of the character set, you'll notice that the buffer still holds the original character. Next to the buffer is another window that contains three rows of the characters that are in the buffer. Move to this window and press the fire button. The buffer character reappears in the Edit window. Whenever you place a new character in the buffer, the previous character is overwritten. The same applies when you place a character in the Edit window. There are several places, though, where you can store characters and keep them safe.

Moving Characters

CD has two function keys that are programmed to pick up and place characters. These keys are f1 and f3. The first one picks up a character, and the second one places it elsewhere on the screen.

You can use these two keys almost anywhere on the screen. These functions are useful when designing text characters. You can, for example, design the letter A and place it anywhere you see the letter A on the screen (other than in the Sketch window and on the Enter line), and it will change all the A's in the text.

You can edit or create 95 different characters and place them almost any-

where on the screen until you're ready to save them. To save your edited characters, you must place them on the Enter line. Move the pointer in front of the word *ENTER* to the < character and press the fire button. Find the seven characters that make up the word *COMPUTE*. Now move over to the > character and press the fire button again. The letters scroll left and right through the frames. You can enter characters here simply by moving to one of the enclosed characters and pressing the fire button.

After you have filled the first seven spaces, scroll seven more onto the screen. When you save characters, CD will always save the first seven character spaces even if you haven't entered that many. Before saving, scroll the Enter line so that the last character that you wish to save is the last (far right) character in the line.

Enter some characters. If you wish to clear the Enter line, move to one of the seven spaces and press the Clr/Home key. We'll discuss more about loading and saving later.

Sketch Window

CD has a 10 x 8 character Sketch window. Here characters can be arrayed to form larger pictures, or you can use the pad as a temporary storage area. Edited characters can be placed in this window with the press of the fire button. The Clr/Home key will clear this entire window as well.

The window can be used to make sketches also. Move the pointer to the round ball in front of the word *SKETCH* and press the fire button. Did you notice that the Command line finally did something? It now indicates that you are in Sketch mode. Look in the upper left corner of the Sketch window. You can see a single pixel blinking rapidly. With the cursor keys or joystick, move the pixel around the window. Pressing the fire button will lock the pixel on, allowing you to draw with it. If you wish to erase with it, press f5 and continue. Function key f5 will toggle the On and Off settings while in Sketch mode.

When you enter the Sketch window, the setting is always toggled to On. With this feature, you can actually use characters to draw a picture. The Clr/

Home key will still function in this mode. To exit Sketch mode, press the Back Arrow key.

Animation

On the lower left side of the screen is an Animation window. This is the Animation Sequence and Speed Control window. The Animation window is a ten-page tablet with a built-in page flipper.

Previously, when you picked up characters, you were actually picking up the character data only and placing it in another area, overwriting the original character's data. When you place a character in the Animation window, it is the actual character. Place the pointer on the indicator in front of the words *PAGE AHEAD* and press the fire button. This is a useful feature for designing characters for a game or fancy title screen.

Move to any character you wish to place on the Animation window and pick it up. Move back to the place where you wish to place the character and press the fire button. It's as easy as that. Clr/Home will clear the Animation window if your pointer is within its frame.

If you continue to press the fire button, the setting will toggle to Off again. When you have finished, be sure to page ahead to be sure that your page is entered correctly. The Slower and Faster features will allow you to adjust the speed of CD's pointer as well as the Animation window.

Command Mode

Move to the Command indicator and press the fire button. You have entered the Command mode. Here, as you can see, there are four options. To enter a command, press the key that corresponds to that command. The space bar will abort Command mode. The Q key will return you to BASIC, the S key will save a sequential file, and the L key will load one. The R for reset will put CD back into its starting condition. This command will clear all the characters that you may have designed. So be careful with it.

To save or load a file, use the proper key. CD will ask for a filename. Enter the filename and press Return. CD works only on disk in drive number 8.

If you need to see the disk directory after you have exited Command mode, just press the shift key and the \$ key. The directory listing can be halted and restarted by pressing any key.

Preferences

CD offers you the ability to change the colors of the screen, border, pointer, frames, text, editing character, and pixel on and pixel off characters. This can be accomplished by placing the pointer over the type of character that you wish to alter and pressing the C key. CD scrolls through all 16 colors, starting from the color that is presently on-screen. Pressing P will color the pointer, B will color the border, S will change the screen color, and so on.

Multi-Color

CD also supports Multi-Color. To enter Multi-Color mode, press the M key. To exit, press it again. You'll notice that Multi-Color can mess up some of the items on the screen. To make them more readable, change their color to a color value less than 8. The character being edited won't show in Multi-Color unless it has a color value greater than 7.

While in Multi-Color, the editing window responds differently as well. This is because color is represented in pairs of bits instead of by each individual bit. To choose the bit pattern that you wish to use, press f5. The bit pattern is displayed on the Command line. Multi-Color characters are displayed according to the screen color, Multi-Color1, Multi-Color2, and the character color. Multi-Color1 and Multi-Color2 are adjusted by typing the 1 key or the 2 key. When this is done, the colors are displayed on the Command line as well.

Key	Action
f1	Picks up a character
f3	Puts down a character
f5	Adjusts pixel pattern
f7	Fire button alternative
C	Character color
P	Pointer color
S	Screen color
B	Border color
M	Multi-Color mode
1	Multi-Color1
2	Multi-Color2
D	Character data

Shift-\$	Directory
Clr/Home	Clears area
Cursor	Moves pointer

Command Mode

S	Save sequential file
L	Load sequential file
R	Reset CD
Q	Quit to BASIC

Character Designer

0801:0B	08	70	17	9E	32	34	30	6E
0809:37	00	00	00	20	20	20	20	96
0811:20	20	20	20	20	A0	C4	B9	06
0819:3C	08	99	F8	00	B9	FD	08	F6
0821:99	33	03	88	D0	F1	A0	09	4C
0829:B9	0C	08	99	FF	03	88	D0	A1
0831:F7	A9	DF	85	2D	A9	22	85	D5
0839:2E	4C	00	01	14	E8	03	DF	AD
0841:22	DD	19	B9	6E	09	99	E8	4C
0849:07	C8	D0	F7	EE	02	01	EE	19
0851:05	01	C6	F9	D0	ED	A2	03	23
0859:20	34	03	F0	33	C9	07	D0	95
0861:16	A2	01	20	34	03	D0	0A	A0
0869:A2	04	20	34	03	18	69	07	65
0871:10	05	A2	0A	20	34	03	85	1D
0879:A8	A5	A7	85	A9	A5	FE	85	FB
0881:F7	A5	FF	85	F8	20	6C	03	73
0889:A5	F8	85	FF	A5	F7	85	FE	72
0891:E8	20	34	03	D0	1E	A2	08	21
0899:20	34	03	A0	02	84	A8	85	2A
08A1:A6	18	A5	FC	65	A6	85	F7	58
08A9:A5	FD	65	A7	85	F8	20	6C	EF
08B1:03	4C	13	01	E8	20	34	03	FB
08B9:D0	1C	A0	03	84	A8	E8	20	36
08C1:34	03	F0	08	A2	08	20	34	F4
08C9:03	4C	5C	01	A2	0F	20	34	CF
08D1:03	E6	A7	4C	5C	01	E8	20	AF
08D9:34	03	D0	0A	E8	20	34	03	B2
08E1:18	69	04	A8	D0	D6	E8	20	37
08E9:34	03	D0	0A	A2	02	20	34	21
08F1:03	18	69	06	D0	ED	A2	08	A2
08F9:20	34	03	D0	E6	A9	00	85	F7
0901:A7	A4	FB	F0	0C	06	FA	2A	37
0909:26	A7	C6	FB	CA	D0	F2	A8	D8
0911:60	48	B1	FE	85	FA	A9	08	FE
0919:85	FB	68	A4	FE	D0	02	64	4A
0921:FF	C6	FE	C0	E7	D0	DE	A4	B5
0929:FF	C0	07	D0	D8	A9	37	85	BA
0931:01	58	4C	28	08	A4	A8	F0	FA
0939:22	A5	F7	38	E5	A8	B0	03	7E
0941:C6	F8	38	85	F7	A5	FC	E5	8A
0949:A8	B0	02	C6	FD	85	FC	B1	3A
0951:F7	88	91	FC	98	D0	F8	C4	42
0959:A9	F0	0A	B1	F7	C6	FD	C6	76
0961:F8	C6	A9	10	EC	60	78	E6	98
0969:01	4C	16	08	60	68	08	0A	11
0971:00	9E	32	30	38	38	16	CE	12
0979:44	20	8C	19	46	52	B8	06	CB
0981:40	F4	82	50	55	54	45	A9	76
0989:2B	B1	AD	C7	8D	11	03	AD	34
0991:01	1B	8D	12	03	78	A9	A0	AB
0999:8D	14	03	A9	1B	90	8F	03	AF
09A1:4A	CC	FF	D8	8D	85	48	78	25
09A9:18	13	29	FB	32	01	95	62	94
09B1:0A	0A	30	B9	00	D1	90	31	86
09B9:44	F8	09	80	32	94	33	99	39

PROGRAMS

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09C1:80 34 C0 FF F0 00 F0 67 0A
09C9:01 50 53 01 09 46 46 01 D9
09D1:58 20 4B 16 6A 1A 1C 51 28
09D9:59 40 04 81 80 B1 94 68 9D
09E1:6A 12 A9 4C CE 97 40 29 26
09E9:B9 DA 1B 99 00 38 E8 17 56
09F1:40 A9 28 E0 8D F8 07 90 90
09F9:EB 01 A9 34 2D E8 00 C1 89
0A01:1B 21 56 0A FF 01 45 83 68
0A09:2A A0 BD 8F 22 91 FB E8 43
0A11:E0 50 F0 0D C8 C0 0A D0 C6
0A19:F1 A3 9F 2F 64 98 35 BE A4
0A21:C9 8C 60 FC 3F 20 DE 19 6A
0A29:38 2A 85 A9 20 96 B8 81 23
0A31:AD C9 36 68 94 15 A9 05 2D
0A39:28 3A 04 11 15 C8 02 8D DE
0A41:E0 1A A9 A1 A8 39 20 E1 E7
0A49:41 51 83 7E 81 78 28 6A 53
0A51:0E 04 9F 02 00 F0 F2 A2 CD
0A59:01 97 35 42 48 1B 36 E3 9D
0A61:23 CD 78 1C 73 39 DD 7C 04
0A69:32 37 FE 3A C9 12 F0 4A 4A
0A71:4C 95 05 1F C9 1A 4C C9 BC
0A79:41 01 DD E9 1A 90 0E 96 8E
0A81:0A 20 35 10 20 4E 37 DB CE
0A89:08 20 D9 90 05 20 39 26 2F
0A91:09 02 A5 F1 81 96 0B 4C 47
0A99:62 0B D0 AF 8D 82 BA 9C 3F
0AA1:82 9C 9D 82 AB 10 AD 45 38
0AA9:03 8A 19 D6 0E 00 29 12 47
0AB1:6B F7 00 5C 4C 86 16 27 0F
0AB9:4B D1 B8 C9 05 F0 BA AB A8
0AC1:4B 0E A7 86 7F CF C9 1C 47
0AC9:F0 D1 C9 29 41 F0 84 04 71
0AD1:01 AC 26 96 0C 87 C9 3B 0D
0AD9:F0 86 F6 0F C9 20 CA 0B 47
0AE1:40 7A 11 D0 70 36 C1 29 EC
0AE9:23 68 01 C7 33 04 6F 54 23
0AF1:07 0F 20 47 A0 F8 12 20 F2
0AF9:54 13 80 B6 E4 F0 9D 20 BE
0B01:94 13 20 89 0E 20 09 14 D9
0B09:20 3B 14 67 F4 E0 05 E4 11
0B11:FF D6 68 82 12 99 4C 0E AF
0B19:C9 9D F0 0A B0 93 09 06 26
0B21:C9 24 F0 32 D4 40 E4 18 EF
0B29:30 36 8A 01 02 40 33 54 12
0B31:20 5A D6 A4 39 D2 C9 0B C6
0B39:F0 CE C1 D6 10 E4 98 46 AC
0B41:08 B1 53 1C 64 9C 82 07 95
0B49:8E DC 29 0F 38 A1 2A 80 0E
0B51:0F E5 FD 5B 2A 4A 02 F0 4D
0B59:32 CD DA 33 C9 08 F0 34 0F
0B61:C0 2E 23 10 F0 05 A9 03 BA
0B69:4C 6B 30 78 00 20 07 61 FD
0B71:60 A0 01 18 43 AC 0E C0 2B
0B79:82 74 F3 A0 00 8C C0 68 92
0B81:25 80 91 21 C8 11 21 C8 24
0B89:9D 21 A9 1D 4C 75 0A 68 72
0B91:07 37 26 7C 3A 11 F0 1C 99
0B99:5A 0F 77 54 4E B4 F4 24 E8
0BA1:30 06 E6 4C 7D 0B 4C 55 31
0BA9:5D 06 DE D3 1D 0A 01 CF 46
0BB1:53 12 C8 4F 49 C4 18 A5 37
0BB9:69 D0 94 CC B1 93 5E 83 34
0BC1:AF 20 2C 31 C9 1F 90 2D 67
0BC9:F5 53 00 26 8F C6 80 22 CC
0BD1:91 DE 10 A9 99 4E E7 28 03
0BD9:C3 17 E7 28 C4 9E 87 16 DC
0BE1:F0 4E BC 87 3B AE 0F 1A E0
0BE9:E6 08 8C 1B 60 88 00 87 65

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0BF1:21 83 18 18 36 4A 09 84 6F
0BF9:A9 06 02 CD 64 74 14 33 D3
0C01:23 EC 3E 19 04 8C 99 0B CF
0C09:2C 9F 99 0F 70 9F 99 07 7F
0C11:79 1E 00 10 F0 3C 2C F0 30
0C19:D2 E4 F5 08 8D 50 01 A0 63
0C21:10 30 72 03 74 8C 08 AC 5E
0C29:06 57 B0 E2 F0 AA 8D A4 50
0C31:4C A4 0B C2 7C 03 47 F0 95
0C39:30 34 E8 30 DA 16 31 9A C2
0C41:E3 30 38 E9 2C C0 E5 98 C5
0C49:EC 34 64 74 0D 40 18 72 C4
0C51:00 33 43 D8 C0 20 03 C2 7B
0C59:06 C6 5D 43 8D C1 02 CF 4D
0C61:AE 81 8D C2 02 47 1E 24 9C
0C69:44 38 F1 14 05 E9 06 28 35
0C71:08 20 30 0C 84 33 4C E6 CC
0C79:0B E1 13 01 C2 E9 41 A4 E6
0C81:13 90 04 C8 4C 32 0C B4 4C
0C89:C9 82 40 00 D8 00 FE 85 79
0C91:28 C7 2D 65 27 A0 28 0B C2
0C99:65 28 58 63 0A C0 27 D0 22
0CA1:EE 32 1A 64 E6 40 00 69 E8
0CA9:3C 8A E5 80 09 3C BC 00 22
0CB1:8D A5 E6 60 B9 3E E2 D0 3A
0CB9:CE 74 D1 00 96 83 A2 89 22
0CC1:01 29 4F 13 03 0E 72 F8 ED
0CC9:A9 F0 21 01 89 2D 07 EE 25
0CD1:8E EA E0 1C 95 00 C1 87 81
0CD9:90 D3 60 4B 2C 00 2E 4F FC
0CE1:D6 46 41 80 FD 09 19 F1 5F
0CE9:50 C8 08 99 43 03 2C 39 AE
0CF1:C4 22 C8 47 A9 19 E1 DD D5
0CF9:15 22 F0 0B 52 43 10 85 39
0D01:25 46 21 88 67 A0 C8 20 5B
0D09:2F 0D 4C BD 0C E0 27 01 96
0D11:8C 54 00 46 C2 51 3C 09 C7
0D19:54 F7 24 64 F0 03 30 2A 44
0D21:05 04 F9 41 63 63 E8 A7 34
0D29:A2 CA 49 28 7A 07 65 A3 51
0D31:C2 83 0A 0A 8A 41 CA 11 6F
0D39:E8 C6 12 CA E0 AA 76 F3 64
0D41:E1 DB A8 B8 0A A7 A2 01 19
0D49:A9 D8 F0 C8 18 4A 90 02 26
0D51:09 80 A8 5D E6 EF 29 9D E1
0D59:03 06 6E 84 33 85 FB 4A 7E
0D61:17 48 00 1D E0 78 C5 FB 5B
0D69:F0 15 CA E8 42 F1 A4 33 7F
0D71:DE 52 81 15 D6 CF 49 18 B1
0D79:D3 79 23 2A 05 CB 0D 16 6A
0D81:71 07 34 00 01 85 33 CA EB
0D89:A3 B0 A5 33 9D E9 62 CA AD
0D91:C0 04 D0 EA 5A A7 8D 4D AF
0D99:86 FC B9 5B 81 51 A0 25 DA
0DA1:FD D0 1F 2C 27 F4 A5 FC EA
0DA9:F3 EC 0F 18 0C E1 CD 53 33
0DB1:35 03 F5 74 B1 0D 18 BD DC
0DB9:E7 65 FC 24 81 09 1A 0E 75
0DC1:28 09 38 A9 FC F9 14 00 E3
0DC9:87 F2 79 1C 0A 6E 03 06 6B
0DD1:21 C0 C2 E3 73 CE 90 F8 34
0DD9:8F 72 00 F1 C9 AD B0 ED CB
0DE1:2F 1D 80 78 81 30 80 F5 36
0DE9:3C 61 00 22 82 00 D7 8F EF
0DF1:5D EF B0 16 F5 80 90 CC CD
0DF9:D2 8B C5 C9 5D B0 C1 97 7E
0E01:A3 70 32 9D CB 00 FC 04 87
0E09:1C 07 FD A2 2C FE A9 4F DE
0E11:E0 6E A9 DA 28 07 3E 13 09
0E19:78 32 54 18 B4 A5 FB 39 77

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0E21:F7 20 D0 0C 01 FF 52 10 D8
0E29:0B 05 FD 4C E8 0E 1D 36 80
0E31:29 91 27 A8 AD E2 55 40 99
0E39:50 DF 20 72 98 BB 80 27 7C
0E41:99 53 27 A5 28 70 30 00 A1
0E49:28 E6 C8 80 C3 D3 57 0E 7E
0E51:60 6B 3F 02 66 F0 39 C9 B3
0E59:57 B0 F4 0C FE 34 F0 60 B7
0E61:64 08 E9 F0 C8 10 E5 18 68
0E69:76 81 DC 0E 77 85 C7 2F 2E
0E71:00 22 1E 9E 80 C6 0D 9B 98
0E79:1C CD 20 9D 0F 17 2E C0 E6
0E81:48 20 5D A9 2C 61 16 40 63
0E89:AC 11 08 E7 00 01 F0 14 B9
0E91:A7 80 20 84 03 F0 26 AC C2
0E99:64 8E 85 0C 8F 86 3A 24 2C
0EA1:8A 06 40 28 1A 0A 58 01 B9
0EA9:4C F3 A9 4D 55 45 0A 30 F6
0EB1:60 03 34 3A 03 06 3C F0 82
0EB9:1C C9 44 96 5F 40 D8 1A 10
0EC1:C9 54 F0 19 C9 5C 02 97 E2
0EC9:C9 64 F0 17 C9 6C 65 53 91
0ED1:F8 B1 91 CA 01 21 4D 20 FC
0ED9:02 69 22 85 20 02 9B 0D 3B
0EE1:4C 08 0E 4C 44 0E C2 23 AF
0EE9:36 62 99 E4 01 22 36 E4 1D
0EF1:11 20 04 10 DC C9 81 70 A1
0EF9:32 C2 2B C0 F6 A5 27 C9 B7
0F01:4F F0 01 60 4C B3 0E C9 40
0F09:61 3E 27 8D CF FC 40 84 9C
0F11:FC 84 FD 84 5A 1B 80 B9 D0
0F19:24 28 30 97 04 8D 8E FE 3D
0F21:69 2D 34 03 61 06 DE 01 D7
0F29:0D 85 FD 2F 12 FB F9 0C 62
0F31:10 2D 05 D4 85 FC B1 FB 10
0F39:5C A5 8D AC 00 41 90 12 A3
0F41:C9 4E B0 14 C9 4C F0 16 A6
0F49:C9 55 11 18 4C 41 4E 53 9C
0F51:B0 81 0F 05 51 39 05 4F 23
0F59:3B 05 8D 50 21 60 A5 FE E1
0F61:29 0F C9 0F F0 06 B9 DC F1
0F69:13 40 54 05 30 A0 02 AD B1
0F71:38 07 E0 10 C7 15 42 C3 65
0F79:01 0E C0 21 0E 21 84 86 4A
0F81:03 1C 80 43 52 3C 0E 27 33
0F89:A2 05 4D C5 44 1C 45 1B 78
0F91:13 73 1C 85 FE 20 89 E0 5E
0F99:07 DC 6C 30 14 55 00 8C 85
0FA1:05 68 2C 20 0E 11 2A 95 82
0FA9:0A 94 09 10 2D 94 8C 15 FD
0FB1:70 29 20 A1 37 83 A3 AD 2D
0FB9:81 8D 22 D0 AD C3 39 8D C9
0FC1:23 D0 63 00 8D 53 21 AD BB
0FC9:51 02 29 EF 8D 16 3C 24 96
0FD1:20 8E 0C 0E 2D 0A 08 FF D4
0FD9:62 34 40 64 C4 A1 B0 C8 5B
0FE1:C0 0E D0 EF FB 00 DF 50 EC
0FE9:8D D3 02 AD D4 A0 CF 01 A8
0FF1:F9 60 AC D0 02 46 66 01 BE
0FF9:A3 B3 AC 4B 40 6D 64 74 16
1001:15 E4 C9 FF F0 07 EC 2C C7
1009:4C 77 11 E0 01 10 AC 54 53
1011:B0 10 36 1C AC 55 21 2C 3F
1019:DF 8D B0 20 A9 A3 C0 D6 D8
1021:6D C3 F8 9C C5 B1 AE D1 F5
1029:A8 42 48 41 63 A2 C2 7B F1
1031:47 D1 40 E1 31 55 D0 68 78
1039:C8 87 69 88 E3 66 5F 1E EA
1041:D2 81 1D AB 06 C8 CC 2C A2
1049:19 F0 05 E8 E8 4C F5 11 D6

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1051:E0 06 E8 BD 57 F1 41 14 75 1281:00 4C C1 14 CB 86 E1 1C 8A 14B1:37 4C C3 FF A5 BA 20 B4 0E
1059:30 2A 0A A9 CA 54 C3 1D 44 1289:2C 71 50 00 4B 09 3C 71 92 14B9:40 70 50 6F 85 B9 20 96 09
1061:E0 04 B9 9C AF 20 E6 4C 0C 1291:71 B0 C4 11 07 2C 71 24 34 14C1:25 0E 99 EE 02 C8 20 A5 3B
1069:61 8B 88 20 C9 04 F0 0C 7C 1299:00 45 1D 07 C0 12 87 79 F9 14C9:D0 98 0D D0 F5 20 AB FF B6
1071:01 89 32 14 EA B0 07 56 7A 12A1:91 00 17 75 1C A9 09 8D EF 14D1:AD EF C2 0D 08 AD F0 02 D0
1079:21 20 E3 11 4C BF 09 30 63 12A9:EC 19 02 CB 1C 14 73 B0 50 14D9:C9 30 D0 01 60 A9 0D 60 41
1081:FC 02 A0 D0 0F 45 BB F0 B7 12B1:C4 41 01 2C 71 CC 09 38 74 14E1:72 F9 19 2C 02 F0 23 E4 A6
1089:09 C9 A4 F0 15 C9 AC F0 5E 12B9:91 B6 80 60 89 07 87 24 06 14E9:B9 15 0C B0 C9 01 F0 30 25
1091:21 C7 EB E1 A1 00 F0 F8 B7 12C1:AD 9E 04 A0 A8 E3 00 28 EB 14F1:5C DE 00 C3 1C 0D C5 49 26
1099:AB 03 60 3C AD EC 24 C9 53 12C9:E2 B0 01 90 42 79 09 18 D6 14F9:18 6D 25 8D 3A 40 93 80 81
10A1:0A F0 E8 60 15 00 C9 02 64 12D1:69 C0 A1 C1 C1 8D 3C 0E F5 1501:C9 32 F0 09 A9 64 51 23 EF
10A9:4C A5 F3 F6 8E 01 04 85 4D 12D9:00 B6 61 0F C0 40 AD E2 0E 1509:CC A9 C8 C8 CE F9 72 18 05
10B1:47 CD FB 91 FD 5E CD 86 0D 12E1:A9 44 E0 03 BA 00 84 0E 25 1511:B9 D9 ED 38 E9 30 AA 96 CB
10B9:07 64 1D 9A 03 22 D0 09 0F 12E9:FC F8 E5 38 0F E3 70 9C 90 1519:2A E0 02 C4 18 69 0A 83 1B
10C1:2E 70 40 14 81 ED 12 31 77 12F1:07 1A ED 00 AC E0 AC 76 96 1521:5B B6 A2 B8 F1 D3 A9 17 CF
10C9:8D 8D CD 02 18 8D CE 02 84 12F9:01 F1 50 50 14 3D 02 16 D9 1529:6C CB D0 BC A9 3E 85 AE 62
10D1:89 DD B1 FD 65 DD 85 78 6A 1301:18 AD 8E 00 2A 8D E8 A9 73 1531:D0 CC BD 0A 6D 00 3C 64 97
10D9:88 09 08 E7 01 05 0E 78 B0 1309:06 08 60 8D E9 02 88 C0 42 1539:45 64 40 F0 F9 C9 4F 38 04
10E1:80 60 A9 94 3E 8D 01 21 24 1311:00 92 AF 20 8E 1A 0C 80 C9 1541:43 18 02 20 C9 22 F0 E5 AF
10E9:A3 31 BC 12 A0 CC 8E 72 A8 1319:1A 58 64 0E DA E2 60 C3 B6 1549:C9 20 90 E9 C9 22 F0 E5 AF
10F1:CC C9 AF B0 E9 90 2D E2 BA 1321:B1 88 4C AC 14 AD C0 D0 40 1551:C9 2C F0 E1 54 7F C8 14 ED
10F9:C9 BD B0 DE DE B5 22 AD 32 1329:85 D0 13 AA AE E1 02 AD 02 1559:F0 DA 1B CD 1D 19 EA 28 3E
1101:C1 3D 02 FB AD C2 02 FC CC 1331:EB 02 83 B3 02 08 CC 3D 80 1561:26 00 F0 CA 4C 32 5F 8B DE
1109:00 DA 01 CD 0E F0 08 AD D0 1339:81 48 C3 41 91 1D 23 10 16 1569:02 38 EE 6A 06 A0 29 C0 EC
1111:CF 02 81 1A C4 21 51 A4 5F 1341:D0 0F 18 05 55 00 33 93 8B 1571:01 B0 4F 23 23 61 83 1F 29
1119:14 88 AE 03 1D F3 01 20 48 1349:50 D0 F7 27 20 64 1A D0 D4 1579:A0 01 B7 38 AD 45 E9 01 06
1121:9D F9 00 C6 F7 20 DC 12 09 1351:85 09 EA 60 A2 F0 F0 00 9A 1581:8D 60 19 4C E4 18 20 10 4A
1129:E8 E0 05 D0 ED 01 71 5A 56 1359:14 30 3E B6 F0 E0 07 B0 92 1589:12 A9 0F C2 1D 21 1B A2 7B
1131:D8 CC C0 0E C9 D5 B0 F4 E1 1361:0A BD 74 C2 2E FD B1 FD 81 1591:00 61 11 75 0B 4C 51 11 CA
1139:28 B8 09 90 ED 4C 77 A6 16 1369:4C 6C 16 B9 6C 21 91 FB 36 1599:0E 28 E2 07 A1 E8 F0 AC 4A
1141:1A 70 BE D0 E3 74 23 9C 45 1371:C8 C3 04 E8 38 F0 02 8C 12 15A1:59 00 93 0B 21 99 35 03 78
1149:90 DC 4C D9 0F D9 D9 03 A8 1379:27 00 01 2F 80 E8 E0 5F 0F 15A9:C8 8C 34 03 8A 8B 04 D0 6D
1151:3B D9 4C 4B 16 DD 46 ED 68 1381:D0 D4 60 BB 0E 40 E8 00 50 15B1:F1 60 A0 6B A8 B9 E7 37 EA
1159:3C 1A 02 E9 E6 25 43 B0 02 1389:26 98 E1 80 1D 48 03 0D 4A 15B9:0A C0 A9 91 D6 85 D3 20 FB
1161:8C D0 6D FB 8C E4 A7 2D DF 1391:BB 01 1C 5E 1B C9 2A F0 84 15C1:6C E5 65 32 A2 00 BD 43 3F
1169:1E 47 3F 2E F0 27 C9 7E 6D 1399:1D C9 3E 0F 1F C9 11 F0 CA 15C9:21 4D E8 E0 A8 50 F5 A9 1F
1171:F0 C9 C9 9E F0 C5 C9 BE 92 13A1:1E CC 4D 04 EA A9 01 9C 90 15D1:9D CC 10 80 31 08 20 20 12
1179:F0 C1 C9 DE F0 BD 40 F6 A1 13A9:CA 80 20 49 4C 09 09 20 A6 15D9:B9 70 32 AA 8C 34 02 30 57
1181:43 F0 B9 4C 08 14 7D C8 D1 13B1:5E D1 56 28 20 D1 20 01 52 15E1:01 C4 1B 80 4C F4 02 C8 C0 57
1189:F9 A1 86 16 00 06 45 E1 C7 13B9:B4 B9 E2 FC 4C 40 08 50 98 15E9:60 19 00 AC F4 02 C8 C0 57
1191:13 E5 C9 A1 F0 2D 50 2A 11 13C1:C6 0D 75 1F 40 E6 16 62 5B 15F1:08 D0 CA 18 3E 3C D0 FA AE
1199:01 30 08 C0 48 D7 02 4C 47 13C9:FC F1 58 E1 17 C0 81 5A 2D 15F9:4C 8E 0C 5F 1F FB A9 04 A5
11A1:FA 13 C0 16 05 08 4D 81 E3 13D1:FA FE 36 3D 45 B7 80 C8 9F 1601:74 8A 80 0F 8E A9 D8 54 2C
11A9:99 E9 D9 18 AD 35 69 01 E5 13D9:80 A7 00 C9 20 D0 F5 88 7F 1609:0A BB 60 B0 A9 1C 48 AD 3C
11B1:B0 0E 8D D8 02 C0 1C F0 2B 13E1:88 76 52 80 20 67 18 F3 FE 1611:4D 8B 0A 20 D0 AD 4C 21 01
11B9:07 40 1E C8 C8 4C E9 13 1E 13E9:01 3A 03 50 0E 02 62 A1 63 1619:8D 21 D0 84 BB B1 30 C9 85
11C1:60 C0 31 D0 F8 5B 31 06 15 13F1:AC A1 FD 95 57 00 81 CF 7D 1621:20 F0 17 91 03 37 41 B0 BD
11C9:D0 F1 79 31 7C 39 95 01 08 13F9:2A 47 B7 FF F4 32 0C 4C D2 1629:08 90 27 C9 4D F0 1D B0 18
11D1:E2 2E A0 D5 11 65 56 94 C1 1401:13 17 20 D9 C9 38 08 41 9A 1631:09 C9 4C 90 0B F0 0F 4C 6D
11D9:03 F0 F6 20 F4 4A 01 30 9D 1409:3B 17 40 75 17 05 03 8C 53 1639:12 C2 5E 51 20 05 4E 3B EC
11E1:A0 61 0B 8A 10 62 01 F0 B3 1411:EE 4C F9 8A 4C 52 16 6F F2 1641:05 4F 3B 05 50 21 4C 3C 57
11E9:1B 60 1A FE 90 BF AD 01 C4 1419:44 76 1B 20 C1 18 20 60 75 1649:1A AD 4B 21 91 FD 20 9E CC
11F1:B9 13 34 90 B8 C9 6D B0 BD 1421:19 20 73 17 00 79 6D 51 CF 1651:1A 20 AC 1A 3B FD 30 43 3F
11F9:B4 C0 93 02 44 0D 4C EB 14 1429:A2 35 A0 03 5F BE 09 E8 25 1659:B2 30 A5 31 BA 8F 31 66 8F
1201:0F AD 00 D0 C9 47 B0 A4 96 1431:70 80 37 81 85 63 CF 9B A5 1661:C9 E8 82 10 36 20 C9 07 CA
1209:4C 49 0E 73 4D 08 29 32 AD 1439:80 F0 2C 90 02 30 38 48 F5 1669:A8 0B 04 1A 40 E5 6C 34 75
1211:4C 72 C6 80 74 63 BE D8 60 1441:01 38 2E 18 AD D7 02 69 79 1671:40 4E 86 28 4F 4E 85 47 AA
1219:2E FC 0A 3F 80 A9 80 D6 4B 1449:07 8D 80 4B C0 05 0C 07 56 1679:65 FD 07 39 FC 65 FE 74 3C
1221:31 80 32 29 08 1D 0A C9 69 1451:30 28 60 38 20 C8 CC D6 BF 1681:0F FD 6D E8 7B F8 05 6D 28
1229:33 F0 3F C9 39 F0 41 C9 81 1459:02 D0 ED 20 80 1A 17 57 68 1689:E9 07 D9 17 0D FB 4D 43 4F
1231:1D F0 3E C9 9D F0 3D C9 79 1461:00 08 30 88 00 35 E6 22 DE 1691:FB A5 FC D7 FC D0 34 A5 7B
1239:91 F0 3C F0 FD 20 3B C9 A9 1469:40 38 64 B8 04 FB 98 ED 07 1699:FD 69 01 E0 A5 FE 69 00 49
1241:06 F0 3A 20 A6 15 C0 F0 E9 1471:A2 4A 40 07 38 40 C3 2A 6A 16A1:36 6A 60 4B 46 69 0C 5C 90
1249:11 01 FD 8D 85 00 61 00 BD 1479:A5 FB C5 FD F0 39 4C CE DF 16A9:19 60 4C 20 09 E5 52 24 AE
1251:42 0E CD C0 24 F0 28 50 65 1481:C0 F0 02 2F 18 4C FC 14 79 16B1:F0 F7 17 B9 18 AD 65 29 3E
1259:42 51 11 25 52 AC 43 58 8B 1489:51 17 20 E2 0E 0F A5 22 6C 16B9:F0 09 04 8D 18 C0 04 00 C5
1261:80 0F 29 8D 14 20 32 16 23 1491:4F 80 B1 04 F3 01 B9 1B 2A 16C1:8D 15 D0 A9 01 A2 93 A0 09
1269:4C 72 14 60 4C F2 14 4C 7B 1499:2D 44 00 C8 C0 0B 9E 4B B0 16C9:21 20 BD CA DD A2 08 2A A6
1271:1F 70 2E 4C 20 02 79 15 DC 14A1:3D 11 4C 1B 12 A5 FC C5 CE 16D1:8C BA 46 C0 40 2A 39 18 FC
1279:4C F8 15 AD EA 02 C2 6F D3 14A9:FE D0 9F A2 00 CD 81 01 DE 16D9:C9 0D F0 57 A2 80 7B 80 50


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16E1:55 9A D3 A0 D2 30 81 40 7E
16E9:D1 51 C0 00 DA 28 4E 41 C0
16F1:8D 53 00 07 0D B0 02 F0 4A
16F9:2B ED 40 AA A3 20 CD BD E0
1701:A9 20 D0 B6 64 F4 F0 0F 79
1709:10 44 38 8E 7E 80 34 4C EA
1711:1B 64 29 0D 08 45 4C 15 DE
1719:1B 20 6F 1B A9 00 C3 85 D6
1721:80 02 20 C3 FF 00 47 20 FE
1729:BA 1A 20 85 1B 4C DB 08 61
1731:B6 B8 43 F0 8E 20 E4 FF 1F
1739:C9 00 D0 F9 60 A5 CB C9 01
1741:40 D0 FA 60 A9 93 20 D2 D7
1749:FF AD CD 83 77 02 FD AD 42
1751:CE 02 85 FE A9 3F 85 FB 59
1759:A9 06 85 FC 20 C6 12 60 FE
1761:8E EC 28 AE 72 E0 06 F0 16
1769:25 80 06 50 AE 22 03 E8 FC
1771:02 EC C9 02 B0 07 E0 51 E9
1779:B7 03 4C C9 1B 60 43 C8 14
1781:D3 CA 02 AE CB 02 6C 11 C7
1789:03 A2 00 8E D3 02 8E D4 63
1791:02 4C AE 1B 80 7D E5 C3 E4
1799:43 A3 58 C0 F2 28 88 43 66
17A1:A0 C0 30 C8 4F 11 85 0B 5C
17A9:8F 8E 38 2E 3C 76 BA 3C 9A
17B1:E4 64 23 63 E3 67 E3 28 B2
17B9:C3 00 4E 36 18 8A 93 8D 96
17C1:8B 8D 83 38 2E 40 66 E3 30
17C9:A3 38 88 1F 1F EB 21 F8 BE
17D1:F8 AE 83 82 63 43 A0 90 BA
17D9:18 10 0A 48 C8 10 7E 7E DF
17E1:7E E8 0A 00 18 18 00 00 EB
17E9:00 EA 83 3A 06 32 02 FF E3
17F1:E4 65 A0 E3 D1 B2 43 93 B1
17F9:0B C0 F0 70 05 58 78 98 16
1801:02 E8 60 00 C8 44 73 B2 69
1809:E1 09 0C 75 1F 22 27 17 2C
1811:50 51 52 53 54 55 56 57 39
1819:58 59 7E FC 64 C3 06 0C B5
1821:09 AF 1E 44 4E 2E 5A 5B 05
1829:5C 5D 5E 5F 60 61 62 63 51
1831:FC F8 C9 86 15 10 17 C7 9E
1839:1C 27 64 65 66 67 68 69 2F
1841:6A 6B 6C 6D 6E F1 93 0D 91
1849:0F FD 42 25 80 71 52 E1 6B
1851:6E 6F 70 71 72 73 74 75 79
1859:76 77 C7 4F 36 0C 05 06 82
1861:FC FE 06 1A 27 78 79 7A BA
1869:7B 7C 7D 7E 7F 80 81 F7 07
1871:F1 93 0E 8F ED 81 1C 4F 37
1879:20 4E 4E 50 3D 82 83 84 9B
1881:85 86 87 88 89 8A 8B 19 36
1889:3F E9 F0 0F 1C 01 2B 1E FB
1891:60 44 02 EC 8C 8D 8E 8F 59
1899:90 91 92 93 94 95 E3 8F 54
18A1:00 A2 01 40 C7 12 05 16 45
18A9:98 25 13 05 D1 15 0C 14 31
18B1:01 D0 1F 20 B0 03 9C 9D EA
18B9:9E 9F 70 3E 55 78 B0 05 06
18C1:EC 08 0B 50 78 24 04 EC 1A
18C9:78 CA 20 09 01 12 01 03 D2
18D1:41 A7 05 04 09 14 4C 02 A0
18D9:07 20 17 09 0E 04 A6 05 DB
18E1:A1 0C D5 0B 05 14 03 08 D7
18E9:F6 69 C3 E3 A0 8E 85 3A 2B
18F1:84 32 06 32 80 E0 29 3C EA
18F9:20 3E 20 05 0E DB 29 E3 34
1901:61 C3 E3 A0 0E 9D 39 E3 F2
1909:33 3C 1E EE 4A 39 A8 42 61

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1911:4A 6B 20 43 3B E3 0C 80 7D
1919:06 01 E5 0F 27 1D 3A 3E 9C
1921:27 2B 13 0C 0F 17 9E 5C 43
1929:00 E2 09 00 87 C4 3B CE C9
1931:49 89 C7 05 80 10 01 07 01
1939:05 4C 08 05 01 04 C2 A7 97
1941:3C 7A 9E 40 A0 4F 4F 7A 63
1949:9A F1 78 88 41 3D 2B A7 D9
1951:8E A7 0B 20 01 0E 09 4F B9
1959:64 14 09 0F 63 0B 10 D7 14
1961:85 C4 3E 41 D6 40 11 20 5D
1969:4F 40 77 31 1E D7 46 3F 71
1971:71 C5 D6 49 73 52 E1 61 47
1979:07 03 04 05 06 07 08 09 26
1981:0A 0B 0C 0D 0E 0F 10 11 AB
1989:12 13 14 15 16 17 18 19 B3
1991:1A 1B 1C A0 06 7F 52 E1 D9
1999:41 1D 65 20 21 22 23 24 5E
19A1:25 26 27 28 29 2A 2B 2C CB
19A9:2D 2E 2F 30 31 32 33 34 D3
19B1:35 36 37 38 39 4E 83 27 A7
19B9:01 68 18 48 ED 3C ED 47 91
19C1:F8 C4 D4 49 41 35 0A 4D 11
19C9:01 0D 01 0E CE 22 E0 E1 63
19D1:E1 15 07 02 15 06 06 05 0D
19D9:12 20 41 45 35 F1 86 0E 26
19E1:8F 87 3A 0E E6 4B 19 C8 45
19E9:08 42 42 46 4D 55 4C 54 0A
19F1:49 2D 05 30 7E B0 31 1C EC
19F9:3A 87 00 7A 52 32 FF 60 8E
1A01:20 43 4F 4D 4D 41 4E 44 25
1A09:CA 87 50 45 89 16 38 40 38
1A11:0F 80 E2 61 05 A0 FF 90 9A
1A19:05 1C 9F 9C 1E 1F 9E 81 C0
1A21:95 96 97 98 99 9A 9B 80 31
1A29:AF E7 10 08 92 01 7F BF 09
1A31:DF EF F7 FB FD FE 14 F1 16
1A39:81 57 2C 53 2C 52 46 49 3F
1A41:4C 86 13 4E 41 4D 48 3F B4
1A49:FF 20 84 7D 01 20 9A 14 BF
1A51:52 89 53 2D 53 41 56 45 DF
1A59:20 4C 2D 4C 4F 41 44 20 43
1A61:52 2D 52 45 53 16 F6 27 B0
1A69:20 51 2D 51 55 FD FF 44 A3
1A71:A0 0F 41 79 DA 00 00 06 56
1A79:04 02 0E 07 00 01 02 02 6C
1A81:6D 6D E6 02 6D 6C 6C 42 FC
1A89:25 20 50 41 54 54 45 52 47
1A91:4E 20 FF FF C3 99 9F 9F 58
1A99:99 C3 FF 18 78 68 80 A8 1C
1AA1:A0 28 45 44 49 54 4F 52 A9
1AA9:87 0F 7E 21 53 4B 45 54 ED
1AB1:43 48 20 4D 4F 44 45 FF 88
1AB9:24 40 7E 4E 1D 87 44 41 95
1AC1:5D 48 64 78 64 07 D8 15 52
1AC9:0B C5 54 13 3C 06 1B 12 F2
1AD1:45 CC 1C 12 13 8D 07 48 A5
1AD9:09 34 12 1B 0C 05 D0 1C C5
1AE1:12 07 8D 44 1C 38 20 B1 8A
1AE9:11 5D A8 D5 0E C3 B0 21 72
1AF1:40 20 0F 20 F1 10 66 C8 97
1AF9:6D 3C 14 12 17 1E 17 E0 D7
1B01:B7 21 91 F1 B0 E1 71 12 AE
1B09:D1 50 84 78 5C C4 81 D1 1F
1B11:E1 71 51 1C 40 20 6C 2D 09
1B19:65 78 84 20 40 64 E5 08 1A
1B21:34 02 E0 00 D1 50 10 19 17
1B29:D0 CE 86 41 31 39 39 32 73
1B31:39 B1 03 0F 0D 77 14 05 35
1B39:40 07 10 15 02 2E 99 0C AC

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1B41:09 0E 14 7B 11 0C 14 04 9E
1B49:46 B0 21 20 20 00 01 0C 84
1B51:0C 50 1B 09 07 08 14 13 29
1B59:20 12 05 13 05 12 16 05 97
1B61:04 20 40 00 00 00 00 00 A9

```

Daniel Lightner is a regular contributor, and he lives in Sidney, Montana.

SMART FORMAT

By Rustin Ambrose

Smart Format for the 1541 drive is a utility program that executes a full NEW format of a disk in one-third the usual time. Anyone who must format a number of disks at one session will appreciate this timesaving feature.

With another welcome feature, Smart Format eliminates head bumping—that banging noise in your drive that normally occurs at the start of a conventional format. Smart Format was designed to work only with the 1541 drive.

Entering the Program

Smart Format is written entirely in BASIC. To help avoid typing errors, use The Automatic Proofreader; see "Typing Aids" elsewhere in this section. Be sure to save a copy of the program before exiting Proofreader.

To use Smart Format, simply load and run it as you would any BASIC program. The program uses DATA statements to send custom machine language routines to the drive.

Why It's Faster

Formatting a disk is usually done with the NEW command, which is written OPEN15, 8, 15, "NO: DISK NAME, ID": CLOSE15. This type of formatting usually takes about 85 seconds. More than half of this time is spent calculating the optimal size of the disk's inter-sector gaps.

The inter-sector gaps are strings of about 4–18 bytes that are added to the end of each sector during formatting. The gap areas are never used by the drive but rather act as padding between sectors of a track. The optimal gap size depends partly on the rotational speed of the drive.

Commodore's Disk Operating System (DOS) repeats a complex algorithm on each track to calculate the best gap size. The time-consuming

part of the algorithm compensates for small changes in drive speed that can occur from track to track. Testing shows, however, that drive speeds don't vary enough during the short time of the NEW command to make a significant difference in the gap calculations. As a result, there's no good reason to repeat the algorithm on every track on a disk.

Smart Format uses the DOS algorithm only on track 1. The gap length for track 1 is then used to calculate the gaps for all other tracks.

Smart Format also improves the efficiency of the routine that clears a track prior to formatting. The combined effect of these changes reduces execution time to about 28 seconds. User group librarians or anyone else who must format a number of disks during one computing session will appreciate this faster procedure.

Eliminating the Bump

When you format a disk using the conventional command, you probably hear a banging noise coming from the drive. This banging sound at the start of formatting is caused by the drive read/write head stepping outward an excessive number of times. The regular format routines do this to guarantee that formatting begins on track 1, the outermost track. The bump can contribute to alignment problems and should be avoided whenever possible. Smart Format uses the drive's internal track counter to move the read/write head precisely to track 1 without the bump.

If the drive hasn't been used since power-up, the internal track counter will need to be initialized. Should Smart Format detect this situation, it will ask the user to insert any formatted disk. The track counter is then updated by reading the track number from the formatted disk using the INITIALIZE command.

Other Details

Smart Format does all of the standard error checking. This includes a full verification of every formatted track. If an error is detected, the program will attempt to correct it up to ten times before giving up. Smart Format's final display shows the number of retries required (usually zero).

The final display also indicates four inter-sector gap lengths (in bytes) used during the format. Each gap value applies to an entire zone of the disk. The track number ranges of the four zones are 1-17, 18-24, 25-30, and 31-35. Drives that rotate at slower speeds will produce larger gap values.

Smart Format makes no permanent changes in the DOS, and all drive commands will function normally. The BASIC program must be used to execute the custom drive routines.

SMART FORMAT

```

JA 100 REM SMART FORMAT BY RUS
      TIN AMBROSE
CE 110 REM COPYRIGHT 1992 - CO
      MPUTE PUBLICATIONS INTL
      LTD - ALL RIGHTS RESER
      VED
RJ 120 REM AS MUST BE FIRST VA
      RIABLE USED IN PROGRAM
FF 130 AS="":C0$=CHR$(0):CR$=C
      HR$(13):VA=PEEK(45)+256
      *PEEK(46)
CX 140 POKE(VA+2),255:POKE(VA+
      3),0:POKE(VA+4),192
QC 150 PRINT"SETTING UP. . ."
FA 160 FORAD=49176TO49375:READ
      X:POKEAD,X:NEXTAD
HS 170 POKE53280,0:POKE53281,0
AP 180 PRINT"{CLR}{8}{DOWN}";C
      HR$(14)
RQ 190 PRINT"*****SMART
      {SHIFT-SPACE}FORMAT V1.
      0*****"
FJ 200 PRINTCR$SPC(11)"1541 FA
      ST FORMAT"CR$SPC(12)"WI
      THOUT 'BUMP'"
CA 210 PRINTCR$SPC(11)"BY RUST
      IN AMBROSE"
EQ 220 PRINT"{3 DOWN}ENTER:
      {2 SPACES}DISKETTE NAME
      ,ID"
JR 230 PRINT"(NAME CAN HAVE MA
      X OF 16 CHARS,"
BM 240 PRINT" I.D. MUST BE 2 C
      HARS LONG)";CR$
PH 250 DN$="":ID$="":INPUTDN$,
      ID$:IF(DN$="")OR(ID$="")
      THENEND
KH 260 LN=LEN(DN$):IFLN>16THEN
      PRINTCR$"--NAME TOO LON
      G.":GOTO220
BH 270 IFLEN(ID$)<>2THENPRINTC
      R$"--I.D. NOT 2 CHARACT
      ERS LONG.":GOTO220
RJ 280 CS$="N0:"+DN$+CHR$(44)+
      ID$+CHR$(13):CL=LEN(CS$
      ):POKE49175,CL
FP 290 FORI1=1TOCL:POKE49151+I
      1,ASC(MID$(CS$,I1,1))+C0
      $:NEXTI1
ED 300 :
```

```

QF 310 CLOSE15:OPEN15,8,15
SQ 320 PRINT#15,"M-R"CHR$(34);
      C0$:GET#15,T$:IFASC(T$+
      C0$)THEN380
HJ 330 PRINTCR$"--INTERNAL TRA
      CK COUNTER OF DRIVE NEE
      DS"
FS 340 PRINT"{2 SPACES}TO BE I
      NITIALIZED."
EG 350 PRINT"{2 SPACES}PLEASE
      {SPACE}INSERT ANY FORMA
      TTED DISKETTE."
BS 360 PRINT"{2 SPACES}THE DIS
      KETTE WILL NOT BE AFFEC
      TED**":GOSUB630
BX 370 PRINT#15,"I0":GOSUB700:
      GOTO320
XG 380 PRINTCR$"--PLACE DISKET
      TE TO BE FORMATTED INTO
      "
FK 390 PRINT"{2 SPACES}DRIVE**
      ":GOSUB630
CP 400 PRINT#15,"M-R"CHR$(30);
      C0$:GET#15,W$:IFASC(W$
      +C0$)AND16THEN430
KJ 410 PRINTCR$"--WRITE PROTEC
      T IS ON."
AG 420 PRINT"--REPLACE DISKETT
      E.":GOSUB630:GOTO400
XF 430 PRINTCR$"--PLEASE CHECK
      THAT DISKETTE IN"
DE 440 PRINT"{2 SPACES}DRIVE S
      HOULD BE FORMATTED."
KS 450 PRINT"{2 SPACES}ALL DAT
      A WILL BE DESTROYED!*"
JC 460 PRINTCR$SPC(7)"[HIT SPA
      CE BAR TO FORMAT":GOSUB
      640
CC 470 PRINT#15,"M-R"CHR$(34);
      C0$:GET#15,T$:IFASC(T$+
      C0$)=0THEN330
XB 480 PRINT#15,"M-R"CHR$(30);
      C0$:GET#15,W$:IF(ASC(W$
      +C0$)AND16)=0THEN410
EC 490 PRINTCR$"--FORMATTING '
      'DN$','ID$' . . ."
EP 500 PRINT#15,"M-W"CHR$(28);
      C0$:CHR$(1):C0$
QM 510 OPEN2,8,2,"#1":PRINT#15
      ,"B-P";2;0:PRINT#2,AS;:
      CLOSE2
FX 520 PRINT#15,"M-E"CHR$(28);
      CHR$(4):GOSUB700
JQ 530 PRINTCR$DONE!
      {3 SPACES}[I.S. GAPS: "
      ;
FR 540 PRINT#15,"M-R"CHR$(5)CH
      R$(6)CHR$(4)
XF 550 FORI1=0TO3:GET#15,G$:G(
      I1)=ASC(G$+C0$):NEXTI1
AE 560 FORI1=3TO0STEP-1:PRINTG
      (I1);:NEXTI1:PRINT"]"
BA 570 PRINTSPC(10)"[# OF RE-T
      RIES:";
DJ 580 PRINT#15,"M-R"CHR$(32)C
      HR$(6):GET#15,ER$:ER=AS
      C(ER$+C0$)
HB 590 PRINTI0-ER"]"
```



```

RH 600 CLOSE15:PRINTCR$***FORM
    AT ANOTHER?***:GOSUB630
    :GOTO220
GH 610 :
MH 620 :
SA 630 PRINTCR$SPC(7)"[HIT SPA
    CE BAR TO CONTINUE]"
SF 640 PRINTSPC(11)"OR 'E' TO
    {SPACE}EXIT]"
DB 650 POKE198,0
SK 660 GETI$:IF I$="E"THENCLOSE
    15:END
QF 670 IF I$<>" "THEN660
JA 680 RETURN
GR 690 :
CS 700 INPUT#15,E1$,E2$,E3$,E4
    $:IFE1$="00"THENRETURN
DH 710 PRINTCR$DRIVE ERROR #"
    E1$:"
KB 720 PRINT""E2$"" TRACK#"E3
    $" SECTOR#"E4$:CLOSE15:
    END
PS 730 :
KP 740 DATA1,4,10,0,174,23,4,1
    34,163,189,255,3,157,25
    5,1,202
BD 750 DATA208,247,160,70,162,
    193,169,132,32,93,4,32,
    48,6,160,13
AB 760 DATA162,238,169,61,32,9
    3,4,32,48,6,160,54,162,
    252,169,174
JH 770 DATA32,93,4,169,76,141,
    0,6,169,123,141,1,6,169
    ,4,32
HG 780 DATA210,200,76,64,238,1
    40,105,4,142,106,4,141,
    3,6,162,0
AH 790 DATA189,255,255,157,48,
    6,232,200,204,3,6,208,2
    43,169,96,157
AS 800 DATA48,6,96,165,81,16,1
    9,169,6,141,33,6,169,15
    ,141,34
KG 810 DATA6,169,10,141,32,6,1
    69,1,133,81,160,0,209,5
    0,240,13
JM 820 DATA201,2,208,6,174,38,
    6,142,4,6,76,251,250,20
    1,1,240
AX 830 DATA52,165,68,74,74,74,
    74,74,170,189,24,4,24,1
    09,4,6
RC 840 DATA157,5,6,141,38,6,32
    ,48,6,173,12,28,41,31,9
    ,192
RD 850 DATA141,12,28,169,255,1
    41,3,28,169,85,141,1,28
    ,162,2,32
EE 860 DATA36,254,76,177,252,7
    6,0,251

```

Rustin Ambrose's initial goal with Smart Format was to protect his drives from the excessive head bumping that can occur during formatting. He lives in West Allis, Wisconsin.

DLINER

By Daniel Lightner

Here's a little program that you can have fun with by devising a variety of useful applications. DLiner is a utility that can convert any area of memory into lines of BASIC data statements. These lines can then be saved and used just like any BASIC program data.

DLiner is written in machine language. To enter it, you'll need MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts for the starting and ending addresses, respond with the following.

Starting address: CCA2

Ending address: CFFE

Be sure to save a copy of the program before you exit MLX.

To use DLiner, load it with the .8,1 extension, type NEW, and press Return. You can then go ahead and load another program. When you're ready to convert an area of memory to data statements, simply type SYS 52386, SA, EA. SA is the starting address of the area you want to convert, and EA is that area's ending address.

To convert the information that appears on a screen, for example, type SYS 52386, 1024, 2023 and press Return. DLiner then creates 1000 data statements, starting with line 9000. Adding a few lines of code to read and poke these same data statements back into memory will re-create the screen.

DLiner can also be used to convert machine language code. If you write a machine language program, you can convert it to data statements and either run the statements with a BASIC loader or combine them to run with other subroutines.

DLINER

```

CCA2:D8 20 7D CF A0 00 A2 00 A7
CCAA:A9 00 C8 C0 FF D0 FB A0 1A
CCB2:00 E8 E0 FF D0 F4 A2 00 42
CCBA:69 01 C9 0A D0 EC AD 06 BE
CCC2:02 C9 2C D0 11 A0 00 B9 27
CCCA:07 02 C9 2C F0 0B 99 35 80
CCD2:03 C8 C0 06 D0 F1 4C 66 E5
CCDA:FE 8C 34 03 88 8C 4C 02 CF
CCE2:20 4D CD AD A7 02 8D C2 97
CCEA:02 AD A8 02 8D C3 02 AC 52
CCF2:C4 02 C8 B9 07 02 C9 2C 24

```

```

CCFA:D0 DC A2 00 C8 B9 07 02 C5
CD02:C9 00 F0 07 9D 35 03 E8 C1
CD0A:C8 D0 F2 98 38 ED C4 02 2B
CD12:A8 88 88 8C 34 03 20 4D 39
CD1A:CD AD A7 02 8D A9 02 AD E1
CD22:A8 02 8D AA 02 AD C2 02 3D
CD2A:8D A7 02 AD C3 02 8D A8 7B
CD32:02 AD AA 02 CD A8 02 90 55
CD3A:9D F0 03 4C D4 CD AD A9 E8
CD42:02 CD A7 02 90 90 F0 8E 9E
CD4A:4C D4 CD A0 00 B9 35 03 59
CD52:A2 00 DD 95 CF F0 06 E8 8B
CD5A:E0 0A D0 F6 60 C8 CC 34 66
CD62:03 D0 EA AD 34 03 C9 05 32
CD6A:90 1C A0 00 B9 35 03 D9 EB
CD72:9F CF B0 03 4C 88 CD D9 12
CD7A:9F CF F0 01 60 C8 C0 05 B4
CD82:F0 03 4C 6E CD 60 EA A9 37
CD8A:00 8D A7 02 8D A8 02 A0 52
CD92:00 AE 34 03 CA BD 8B CF C4
CD9A:8D AA 02 BD 90 CF 8D AB 4E
CDA2:02 B9 35 03 8C AC 02 38 D7
CDAE:E9 30 A8 18 C0 00 F0 17 DC
CDB2:18 AD A7 02 6D AA 02 8D 82
CDBA:A7 02 AD A8 02 6D AB 02 0A
CDC2:8D A8 02 88 4C AD CD AC 79
CDCA:AC 02 CA C8 CC 34 03 D0 31
CDD2:C4 60 18 AD A9 02 69 01 EF
CDDA:8D A9 02 AD AA 02 69 00 F2
CDE2:8D AA 02 AD A7 02 85 FB 57
CDEA:AD A8 02 85 FC A9 00 8D 3C
CDF2:AB 02 A9 28 8D AE 02 A9 71
CDFA:23 8D AF 02 A9 01 8D AC BA
CE02:02 A9 08 8D AD 02 A9 03 B0
CE0A:8D B0 02 A9 08 8D B1 02 51
CE12:A0 00 AD B0 02 85 FD AD 90
CE1A:B1 02 85 FE AD AE 02 91 6F
CE22:FD AD AF 02 C8 91 FD A0 69
CE2A:00 18 AD AE 02 69 01 8D B3
CE32:AE 02 AD AF 02 69 00 8D 9B
CE3A:AF 02 20 CC CE 20 CC CE 60
CE42:A9 83 91 FD 20 CC CE B1 2B
CE4A:FB AA A9 00 20 77 CE A0 E2
CE52:00 A9 2C 91 FD 18 A5 FB 90
CE5A:69 01 85 FB A5 FC 69 00 51
CE62:85 FC 4C DA CE EE AB 02 C4
CE6A:AD AB 02 C9 10 D0 D5 20 36
CE72:26 CF 4C 14 CE 8D 2F CB B8
CE7A:8E 2E CB A2 09 8E 20 CB 1D
CE82:A0 B0 AD 2E CB DD A8 CF 2C
CE8A:AD 2F CB FD A9 CF 90 FD E0
CE92:8D 2F CB AD 2E CB FD A8 5C
CE9A:CF 8D 2E CB C8 D0 E3 98 EF
CEA2:CA F0 10 C9 B0 F0 03 8D 5D
CEAA:20 CB 2C 20 CB 30 04 A9 A3
CEB2:00 F0 05 29 7F 20 BE CE 88
CEBA:CA 10 C5 60 8C B4 02 A0 5C
CEC2:00 91 FD 20 CC CE AC B4 36
CECA:02 60 18 A5 FD 69 01 85 FB
CED2:FD A5 FE 69 00 85 FE 60 C3
CEDA:A5 FB CD A9 02 F0 03 4C C4
CEE2:67 CE A5 FC CD AA 02 F0 7A
CEEA:03 4C 67 CE 20 26 CF A9 D9
CEF2:00 91 FD C8 91 FD C8 91 E8
CEFA:FD 18 A5 FD 69 02 85 2D BD
CF02:A5 FE 69 00 85 2E A5 2D BE
CF0A:85 2F 85 31 A5 2E 85 30 1D
CF12:85 32 A0 00 B9 A4 CF 99 AE
CF1A:77 02 C8 C0 05 D0 F5 84 F6
CF22:C6 4C 66 FE A9 00 8D AB 09

```



```

CF2A:02 A9 00 91 FD 20 CC CE 27
CF32:A5 FD 8D B0 02 A5 FE 8D 13
CF3A:B1 02 AD AC 02 85 FD AD 83
CF42:AD 02 85 FE AD B0 02 91 9F
CF4A:FD AD B1 02 C8 91 FD A0 D3
CF52:00 AD B0 02 85 FD 8D AC 7F
CF5A:02 AD B1 02 8D AD 02 85 69
CF62:FE A9 00 91 FD C8 91 FD 39
CF6A:A0 00 20 CC CE 20 CC CE 8A
CF72:A5 FD 8D B0 02 A5 FE 8D 53
CF7A:B1 02 60 A0 00 B9 B3 CF A7
CF82:20 D2 FF C8 C0 4C D0 F5 42
CF8A:60 01 0A 64 E8 10 00 00 A9
CF92:00 03 27 30 31 32 33 34 C7
CF9A:35 36 37 38 39 36 35 35 0F
CFA2:33 35 4C 49 53 54 0D 01 4E
CFAA:00 0A 00 64 00 E8 03 10 CC
CFB2:27 0D 54 48 45 20 44 4C B7
CFBA:49 4E 45 52 0D 43 4F 50 C4
CFC2:59 52 49 47 48 54 20 31 46
CFCA:39 39 32 20 43 4F 4D 50 DF
CFD2:55 54 45 0D 50 55 42 4C 54
CFDA:49 43 41 54 49 4F 4E 53 D4
CFE2:20 49 4E 54 4C 20 4C 54 C3
CFEA:44 0D 41 4C 4C 20 52 49 AD
CFF2:47 48 54 53 20 52 45 53 30
CFFA:45 52 56 45 44 00 00 00 13

```

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XLOGIC

By Richard Penn

Merge and renumbering utilities all have their place, but a good debugger is a tool that no programmer should be without. Although it's not absolutely necessary for short programs, using one can save you a great deal of time when you're writing lengthy code.

XLogic is a BASIC debugging tool that's simple enough to be used by novices, yet powerful enough to meet the needs of even the most demanding programmer. It has no gimmicks, only the bare essentials—the bare essentials to locate and blow any bug off the silicon landscape, that is.

First, it enhances the LIST command to display in color the paths of all GOTO statements, IF/THEN statements, and other branches. This lets you follow a program's logic at a glance, even if you're viewing someone else's program for the first time. A description doesn't do justice to its power. After using it, you'll feel half-blind looking at a conventional listing.

If you need a closer look at program flow, the trace routine shows each line and highlights every statement as it executes. Up to four variables (including array variables) can be displayed inside

the trace window. The window can be placed at the top or at the bottom of your screen so that it won't overwrite something important. Finally, the speed of the trace can be varied, and the code can be single-stepped. You can also dump all the variables and functions, color-coded by type, into memory.

Typing It In

XLogic is written entirely in machine language. To enter it, you'll need to use MLX, our machine language entry program; see "Typing Aids" elsewhere in this section. When MLX prompts you, respond with the values given below.

Starting address: C000

Ending address: CBF7

When you've finished typing, be sure to save a copy of the program before exiting MLX.

Four Commands

To use XLogic, just follow these simple steps. Load the program with a command of the following form: LOAD "XLOGIC",8,1. Of course, you should replace XLOGIC with whatever name you used when you saved the XLogic data. Type NEW. Activate the program with SYS 49152.

XLogic's features are easily accessed with four new commands that work only in direct mode. You're limited to one XLogic command per line, which can be abbreviated by typing the left arrow (←) and the first letter (or as many characters after these initial two as you like).

Both ←LIST and ←TRACE activate debugging modes, as opposed to most commands that perform an immediate function. You can program normally in either mode. Apart from the enhanced features, you won't even know one of these features is on unless you list or run a program.

Only one mode can be used at a time, so activating a new mode will replace the current one. Run/Stop-Restore won't disable a mode. To turn off either mode, use the ←OFF command.

The command ←VAR is always available and is unaffected by ←OFF. XLogic itself will remain active until you shut off the computer.

The command ←LIST turns on

branch mapping. A branch is any point where a BASIC program jumps to another line and is done with the GOTO, GOSUB, IF/THEN, ON/GOTO, or ON/GOSUB commands.

Most cross-reference utilities print a line-number list, which is not very useful. XLogic highlights branches in color within the listing so that you can see where each branch goes and continue programming normally at the same time. In this mode, the LIST command changes the screen color to black and lists everything in light blue, but it prints all branches and the lines they reference in matching colors.

For example, let's look at this simple program.

```
10 PRINT "XLOGIC"
```

```
20 PRINT
```

```
30 FOR T = 1 TO 10 : NEXT : GOTO 10
```

With ←LIST, GOTO 10, all of line 10 would be listed in white. The rest of the program would be light blue.

The key to reading a colored listing is the line number, which is always light blue unless some other line branches to it. Whenever you see a line number (and the rest of the line, since lines match their line-number color) that isn't light blue, you know that there's at least one command somewhere in the program that jumps to this line. It's then a simple matter of matching up all the branch commands of the same color with the line that's that color. If all this sounds confusing, don't worry; it will become obvious when you see it on the screen.

The 64 has 16 colors, so there's a limit to how many branches can be mapped. Since light blue is the neutral color and characters are invisible if they're the same color as the screen, that leaves 14 free. However, ←LIST also uses reverse video, so a total of 28 different branches can be displayed. If there are more than 28 branches, the surplus branches are all highlighted in light blue reverse video. So although they're still shown, you can't tell different jumps apart. This isn't a serious problem, because ←LIST only cross-references the lines you list.

If you type LIST alone, the entire program is cross-referenced. But if you type a command such as LIST 100—

200, only the lines 100-200 are cross-referenced.

Since **←LIST** cross-references branches on a first-come-first-served basis, don't be surprised if the colors change when you're listing different groups of lines. Although the colors may be different, the program listing is still accurate.

There are two error messages that you can get with **←LIST**. The first is an **UNDEFINED BRANCH** error message with the offending line printed beneath. This happens when there's a branch command with a syntax error somewhere in the program, such as **GOTO** with a missing line number. Simply cursor up to the line, correct it, and list again.

It's rare that anyone will see the second error, which occurs when there are too many branches. This shouldn't be confused with the 28-branch color limit. Although **←LIST** is able to display only 28 different branches, it can handle over 1300 internally. Few programs for the 64 need this many branches, but **←LIST** will inform you if you ever exceed this limit! Should that occur, simply list smaller groups of lines.

The command **←TRACE** turns on the execution trace. This mode displays a trace window whenever you run a program. Use it to see exactly what a program is doing as it runs and to find out when and why variables are changing.

Also, if you get a syntax error but can't tell what's wrong with the line in question, **←TRACE** will show you exactly where the program stopped.

The command **←TRACE** prompts you for several settings. If you change your mind during this procedure, press **Run/Stop-Restore** to cancel. First, it asks you if you want the trace window to be at the top or at the bottom of the screen. This lets you put it where it won't overwrite anything important. Next, you're prompted to select the execution speed. You have the choice of running the program at the fastest possible speed (normal), slower (delay), or slowest, (single step) through the code.

When single-stepping, hit any key on the keyboard (hold it down for continuous execution) to execute the next command. If you single-step a program that waits for a keypress with the

GET command, remember to hold down the key the program expects when the trace reaches the **GET**. (It's better to avoid single-stepping programs with many **GET** commands.)

Regardless of which speed you select, keep in mind that a traced program runs slower than normal, so hold down all keys including **Run/Stop** until they catch.

You also have the option of displaying up to four variables during the trace. To enter the variables, type them in the order that you want them to appear and separate them with a slash (/). An entry such as **A/B/C/BOX(A,B,C)** is legal and still counts as only four variables, since **BOX(A,B,C)** prints only one value.

If you accidentally enter an illegal variable and run the program, the trace will stop and display an error beside the variable it doesn't understand. If this happens, use the **←TRACE** command again to enter the correct variables. Also, strings must be less than 36 characters in length, or they won't fit inside the window.

To try out the various trace options, enter and run this short program.

```
10 A=1: B=2: C=3: D=4: E=5: F=6: G=7: H=8:
   GOTO 10
```

The command **←TRACE** uses light blue to display the current line and variables and highlights commands in white as they're executed. If these colors conflict with your program's screen color, change it temporarily while you debug your program. Also note that the **LIST** command won't work properly with **←TRACE** on.

The command **←VAR** dumps all non-array variables and functions in memory, color-coded by variable type, to the screen. Functions are followed by the notation **FN**.

The command **←OFF** disables all XLogic commands except for **←VAR**.

Debugging BASIC with ML

XLogic is a BASIC debugging tool. If your program uses any machine language routines, there might be a memory conflict.

Note that XLogic resides from 49152 to 52208, downloads and modifies BASIC ROM, and changes several vec-

tors. It also uses all of the RAM underneath Kernal ROM and part of the cassette buffer as work areas. ML is safe to use with XLogic, provided that it isn't located in any of these potential trouble spots.

XLOGIC

```
C000:4C B8 CA 08 8D 34 03 8E 81
C008:35 03 8C 36 03 AD 4B 03 42
C010:D0 46 A2 FF B5 00 9D F1 BA
C018:CB CA E0 02 D0 F6 A9 01 25
C020:8D 4B 03 A5 5F 85 FD A5 A8
C028:60 85 FE A5 15 8D 40 03 D7
C030:C9 FF D0 08 A9 FE 8D 3F D4
C038:03 4C 41 C0 A5 14 8D 3F 5A
C040:03 20 A2 C1 A2 FF BD F1 3E
C048:CB 95 00 CA E0 02 D0 F6 69
C050:A9 00 85 FD A9 F0 85 FE 52
C058:A9 00 8D 3A 03 8D 21 D0 65
C060:A9 0E 8D 86 02 A9 00 85 90
C068:FB A9 E0 85 FC A0 00 C8 F9
C070:20 DE C0 C9 FF D0 05 A9 65
C078:0E 4C BF C0 88 20 DE C0 5B
C080:CD 35 03 D0 09 C8 20 DE 2E
C088:C0 CD 34 03 F0 0E A2 03 9C
C090:E6 FB D0 02 E6 FC CA D0 50
C098:F7 4C 6D C0 C8 20 DE C0 28
C0A0:C9 00 D0 0C A9 0E 8D 86 09
C0A8:02 A9 12 85 C7 4C C2 C0 E5
C0B0:C9 0F 90 07 38 E9 0E A2 85
C0B8:12 86 C7 AA BD 03 CB 8D A7
C0C0:86 02 AD 86 02 8D 4D 03 08
C0C8:A5 C7 8D 4C 03 AD 34 03 BF
C0D0:AE 35 03 AC 36 03 28 85 B5
C0D8:62 86 63 4C D1 BD 78 A2 77
C0E0:34 86 01 B1 FB A2 36 86 B6
C0E8:01 58 60 08 8D 37 03 8E 6B
C0F0:38 03 8C 39 03 A6 D4 D0 A1
C0F8:61 AE 3A 03 E0 01 9D 25 9F
C100:C9 3A D0 13 A9 00 8D 3A E4
C108:03 AD 4C 03 85 C7 AD 4D 26
C110:03 8D 86 02 4C 5A C1 E0 99
C118:02 D0 3F C9 2C D0 03 20 20
C120:67 C1 4C 5A C1 4C 57 C4 A9
C128:29 C9 8D F0 25 C9 A7 D0 E3
C130:12 C8 B1 5F C9 2D F0 F9 C5
C138:C9 30 90 1E C9 3A B0 1A 53
C140:4C 52 C1 C9 91 D0 13 A9 F2
C148:02 8D 3A 03 20 67 C1 4C 16
C150:5A C1 A9 01 8D 3A 03 20 32
C158:67 C1 AD 37 03 AE 38 03 6F
C160:AC 39 03 28 4C 1A A7 A9 2F
C168:00 85 C7 A0 00 78 A2 34 AB
C170:86 01 B1 FD A2 36 86 01 89
C178:58 C9 00 D0 0C A9 0E 8D 58
C180:86 02 A9 12 85 C7 4C 9B 9D
C188:C1 C9 0F 90 07 38 E9 0E 45
C190:A2 12 86 C7 AA BD 03 CB 55
C198:8D 86 02 E6 FD D0 02 E6 51
C1A0:FE 60 A9 FF 8D 00 E0 8D AC
C1A8:01 E0 A9 01 8D 3B 03 A9 33
C1B0:00 8D 3C 03 8D 4A 03 A9 94
C1B8:00 85 FB A9 F0 85 FC EE 3E
C1C0:3F 03 D0 03 EE 40 03 A0 0E
C1C8:00 B1 FD 8D 41 03 C8 B1 AA
C1D0:FD 8D 42 03 C8 C8 B1 FD F9
```


C1D8:CD 40 03 90 0C 88 B1 FD A0	C408:9A 4C 74 A4 A2 00 BD 25 80	C638:90 F9 A9 8D 20 D2 FF 68 4F
C1E0:CD 3F 03 90 03 4C 64 C2 59	C410:CB 20 D2 FF E8 C9 00 D0 21	C640:A8 C8 B1 FB F0 0C E6 FB CB
C1F8:C8 C8 B1 FD C9 22 D0 08 99	C418:F5 A9 37 85 01 A9 1A 8D B6	C648:D0 02 E6 FC 88 D0 F7 4C 2F
C1F0:AD 4A 03 49 01 8D 4A 03 A8	C420:06 03 A9 A7 8D 07 03 A2 4E	C650:FF C5 A9 CA 8D 26 03 A9 E5
C1F8:AD 4A 03 D0 40 4C 3B C4 C1	C428:FA 9A A0 02 B1 FD 85 14 AE	C658:F1 8D 27 03 A9 4C 8D 14 05
C200:89 D0 06 20 65 C2 4C 3D 4D	C430:C8 B1 FD 85 15 20 13 A6 98	C660:A7 A9 ED 8D 28 03 A9 47 AA
C208:C2 C9 8D D0 06 20 65 C2 5E	C438:4C BD A6 B1 FD C9 CB D0 C6	C668:8D 18 03 AD 50 03 C9 02 22
C210:4C 3D C2 C9 A7 D0 1D 8C 47	C440:0E C8 B1 FD C9 20 F0 F9 C3	C670:D0 12 20 24 EA A0 00 A9 B4
C218:43 03 C8 B1 FD C9 20 F0 7C	C448:C9 A4 F0 08 4C 0C C4 C9 64	C678:2D 91 D1 A9 0E 91 F3 C8 3D
C220:F9 C9 30 90 0A C9 3A B0 C0	C450:89 4C 01 C2 4C 03 C2 C9 BB	C680:C0 28 90 F3 AD 50 03 C9 48
C228:06 20 73 C2 4C 3D C2 AC DC	C458:CB F0 07 C9 89 F0 03 4C E3	C688:00 F0 07 C9 01 F0 23 4C 2E
C230:43 03 B1 FD C9 91 D0 05 69	C460:29 C1 4C 52 C1 AD 3C 03 DD	C690:BE C6 A9 20 A6 D3 9D 00 26
C238:A9 01 8D 3C 03 B1 FD F0 14	C468:D0 A2 A9 00 8D 4A 03 60 34	C698:04 E8 E0 50 90 F8 A2 00 31
C240:03 4C E9 C1 A9 00 20 65 A6	C470:08 48 A5 3A C9 FF F0 18 B0	C6A0:A9 2D 9D 50 04 A9 0E 9D 87
C248:C4 8D 3C 03 AD 41 03 85 49	C478:A9 37 85 01 A9 1A 8D 06 3C	C6A8:50 D8 E8 E0 28 90 F1 4C 73
C250:FD AD 42 03 85 FE A0 00 22	C480:03 A9 A7 8D 07 03 A9 E4 40	C6B0:BE C6 A9 20 A6 D3 9D 70 B6
C258:B1 FD D0 05 C8 B1 FD F0 9A	C488:8D 08 03 A9 A7 8D 09 03 5E	C6B8:07 E8 E0 78 90 F8 AD 51 BC
C260:03 4C C7 C1 60 C8 B1 FD 17	C490:68 28 4C E4 A7 08 48 8A A8	C6C0:03 C9 01 F0 07 C9 02 F0 C5
C268:C9 20 F0 F9 AD 3C 03 C9 C6	C498:48 98 48 A5 3A C9 FF D0 99	C6C8:10 4C E5 C6 A0 1E A2 FF 5D
C270:01 F0 3D A2 00 B1 FD C9 11	C4A0:03 4C F7 C6 A2 FF B5 00 AA	C6D0:CA D0 FD 88 D0 F8 4C E5 29
C278:30 90 32 C9 3A B0 2E 9D AB	C4A8:9D F1 CB CA E0 02 D0 F6 4B	C6D8:C6 20 9F FF A5 CB C9 40 F5
C280:84 03 C8 E8 B1 FD C9 3A 04	C4B0:AD 86 02 8D 4E 03 A9 13 B0	C6E0:F0 F7 4C CC C6 A2 FF BD B9
C288:F0 0B C9 00 F0 07 C9 20 D9	C4B8:20 D2 FF AD 50 03 C9 00 04	C6E8:F1 CB 95 00 CA E0 02 D0 C3
C290:F0 03 4C 77 C2 A9 2C 9D 03	C4C0:F0 0C C9 01 F0 11 C9 02 70	C6F0:F6 AD 4E 03 8D 86 02 68 52
C298:84 03 C8 E8 A9 30 9D 84 03 DC	C4C8:F0 31 C9 03 F0 3D A5 DA 23	C6F8:A8 68 AA 68 28 20 2C A8 93
C2A0:E8 A9 00 9D 84 03 20 A7 F6	C4D0:09 80 85 DA 4C 3F C5 A5 ED	C700:60 08 48 A9 0E 8D 86 02 1B
C2A8:C3 20 FF C2 60 4C 0C C4 55	C4D8:EF 09 80 85 EF A9 11 A2 EF	C708:CC 4F 03 B0 05 A9 01 8D 9B
C2B0:A2 00 B1 FD C9 30 90 41 0F	C4E0:16 20 D2 FF CA D0 FA A2 0A	C710:86 02 68 28 4C 1A A7 08 15
C2B8:C9 3A B0 3D 9D 84 03 C8 69	C4E8:00 A9 2D 9D 48 07 A9 0E 1C	C718:48 C9 0D D0 07 68 A9 00 1A
C2C0:E8 B1 FD C9 2C F0 0F C9 90	C4F0:9D 48 DB E8 E0 28 90 F1 20	C720:28 4C CA F1 68 28 4C CA 96
C2C8:3A F0 0B C9 00 F0 07 C9 41	C4F8:4C 3F C5 A2 00 B5 D9 09 EE	C728:F1 08 48 78 A9 31 8D 14 84
C2D0:20 F0 03 4C B2 C2 A9 2C E7	C500:80 95 D9 E8 E0 08 90 F5 39	C730:03 A9 EA 8D 15 03 58 A9 F0
C2D8:9D 84 03 C8 E8 A9 30 9D 84 0B	C508:4C 3F C5 A2 11 B5 D9 09 88	C738:CA 8D 26 03 A9 F1 8D 27 DC
C2E0:03 E8 A9 00 9D 84 03 20 7C	C510:80 95 D9 E8 E0 19 90 F5 8D	C740:03 A9 4C 8D 14 A7 A9 ED 9E
C2E8:A7 C3 20 FF C2 B1 FD C9 D9	C518:A9 11 A2 11 20 D2 FF CA 39	C748:8D 28 03 A9 47 8D 18 03 47
C2F0:2C F0 09 C9 A9 00 8D 3C 03 36	C520:D0 FA A2 00 A9 2D 9D 80 E4	C750:AD 06 03 C9 01 F0 23 AD F4
C2F8:60 4C 0C A4 4C 65 C2 8C 99	C528:06 A9 0E 9D 8D 8A E8 E0 DE	C758:52 03 D0 22 A9 00 8D 4B C1
C300:48 03 A9 A0 85 9B A9 E0 70	C530:28 90 F1 A2 00 A9 20 9D E0	C760:03 A9 0E 8D 86 02 A9 EB F1
C308:85 9C 78 A2 35 86 01 A0 19	C538:C0 07 E8 E0 28 90 F8 A9 30	C768:8D 06 03 A9 03 8D 07 03 88
C310:00 B1 9B CD 44 03 D0 1F 43	C540:60 8D 14 A7 A5 39 85 14 8D	C770:A9 70 8D 08 03 A9 C4 8D F8
C318:C8 B1 9B CD 45 03 D0 16 AE	C548:A5 3A 85 15 A9 C1 8D 18 BE	C778:09 03 A9 36 85 01 68 28 0F
C320:C8 B1 9B A0 00 91 FB A2 D6	C550:03 A9 EF 8D 28 03 20 13 3F	C780:4C 83 A4 08 48 8A 48 98 C1
C328:36 86 01 58 E6 FB D0 02 DC	C558:A6 38 A5 7A E5 5F 8D 4F B8	C788:48 AD 00 02 C9 5F F0 03 78
C330:E6 FC AC 48 03 60 88 B1 E0	C560:03 A9 17 8D 26 03 A9 C7 EB	C790:4C 55 CA AD 01 02 C9 54 C7
C338:9B C9 FF D0 56 C8 B1 9B E1	C568:8D 27 03 A9 0E 8D 86 02 35	C798:F0 03 4C EC C8 20 5E CA 08
C340:C9 FF D0 4F A2 36 86 01 B7	C570:A5 14 D0 33 A5 15 D0 2F 73	C7A0:A2 00 BD 3C CB 20 D2 FF 91
C348:58 A0 00 AD 44 03 91 9B EB	C578:A0 00 B1 2B 85 FB C8 B1 9C	C7A8:E8 C9 00 D0 F5 A5 C5 C9 C7
C350:C8 AD 45 03 91 9B C8 AD BA	C580:2B 85 FC A0 00 B1 FB 85 F0	C7B0:1C F0 09 C9 16 D0 F6 A9 D3
C358:3B 03 91 9B C8 A9 FF 91 A8	C588:FD C8 B1 FB 85 FE A0 00 A4	C7B8:00 4C BE C7 A9 01 8D 50 6C
C360:9B C8 91 9B A0 00 AD 3B 6F	C590:98 91 FB C8 91 FB 20 BD 53	C7C0:03 A2 00 BD 52 CB 20 D2 2B
C368:03 91 FB E6 FB D0 02 E6 D1	C598:A6 A0 00 A5 FD 91 FB C8 F0	C7C8:FF E8 C9 00 D0 F5 A5 C5 3B
C370:FC A5 FC C9 00 F0 60 AD 4E	C5A0:A5 FE 91 FB 4C AA C5 20 69	C7D0:C9 27 F0 0D C9 12 F0 0E 84
C378:3B 03 D0 04 AC 48 03 60 A5	C5A8:BD A6 AD 50 03 C9 02 F0 AB	C7D8:C9 0D D0 F2 A9 02 4C E8 B0
C380:EE 3B 03 AD 3B 03 C9 1D 20	C5B0:07 C9 03 F0 22 4C 52 C6 4F	C7E0:C7 A9 00 4C E8 C7 A9 01 3E
C388:90 05 A9 00 8D 3B 03 CA DA	C5B8:A9 20 A6 D3 9D 00 04 E8 11	C7E8:8D 51 03 A2 00 BD 79 CB D3
C390:48 03 60 A2 03 E6 9B D0 EE	C5C0:EE 78 90 F8 A9 13 20 D2 29	C7F0:20 D2 FF E8 C9 00 D0 F5 B9
C398:02 E6 9C CA D0 F7 A5 9C 69	C5C8:FF A9 11 20 D2 FF 20 D2 8C	C7F8:A5 C5 C9 40 D0 FA A5 C5 8D
C3A0:C9 F0 B0 33 4C 0F C3 E0 99	C5D0:FF 20 D2 FF 4C F2 C5 A9 22	C800:C9 27 D0 03 4C BB C8 C9 37
C3A8:08 B0 61 E0 07 D0 12 AD E7	C5D8:20 A6 D3 9D A8 06 E8 E0 82	C808:19 D0 F3 AD 50 03 C9 00 D5
C3B0:84 03 C9 37 B0 56 C9 36 90	C5E0:78 90 F8 A9 13 20 D2 FF 45	C810:F0 05 A9 03 4C 19 C8 A9 C2
C3B8:D0 07 AD 85 03 C9 34 B0 D0	C5E8:A9 11 A2 14 20 D2 FF CA 3A	C818:02 8D 50 03 A2 00 BD 94 6D
C3C0:4B 8C 49 03 A5 7A 8D 46 E2	C5F0:D0 FA A9 5B 85 FB A9 03 01	C820:CB 20 D2 FF E8 C9 00 D0 39
C3C8:03 A5 7B 8D 47 03 A9 84 A1	C5F8:85 FC A9 0E 8D 86 02 00 C7	C828:F5 A9 00 85 C6 A0 00 8C BC
C3D0:85 7A A9 03 85 7B 20 EB 65	C600:00 B1 FB 00 FF C9 24 D0 41	C830:53 03 A9 A4 20 D2 FF C6 BE
C3D8:B7 A5 14 8D 44 03 A5 15 8F	C608:04 A2 01 86 D4 20 D2 FF 95	C838:D3 20 E4 FF F0 FB AC 53 7C
C3E0:8D 45 03 AD 46 03 85 7A 7F	C610:C8 4C 01 C6 A9 20 20 D2 82	C840:03 C9 0D D0 0E AD 5B 03 55
C3E8:AD 47 03 85 7B AC 49 03 F5	C618:FF A5 FB 85 7A A5 FC 85 D0	C848:C9 41 90 ED C0 00 F0 E9 D1
C3F0:88 C8 B1 FD C9 20 F0 F9 AF	C620:7B 98 48 A5 D1 85 FD A5 3B	C850:4C 8D C8 C9 14 D0 19 AC E3
C3F8:60 A2 00 BD 12 CB 20 D2 08	C628:D2 85 FE 20 A0 AA A4 D3 2F	C858:53 03 F0 DD C6 D3 A9 20 49
C400:FF E8 C9 00 D0 F5 A2 FA 9B	C630:88 A9 20 91 D1 C8 C0 28 E4	C860:20 D2 FF 20 D2 FF C6 D3 B0


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C868:C6 D3 CE 53 03 4C 32 C8 D7
C870:C0 26 F0 C5 C9 20 F0 08 1F
C878:C9 24 90 BD C9 5B B0 B9 BC
C880:AC 53 03 99 5B 03 20 D2 31
C888:FF C8 4C 2F C8 A9 20 20 16
C890:D2 FF A9 0D 20 D2 FF A2 80
C898:00 A0 FF C8 CC 53 03 F0 89
C8A0:11 B9 5B 03 C9 2F D0 F3 65
C8A8:A9 00 99 5B 03 E8 E0 04 79
C8B0:90 E9 A9 00 99 5B 03 C8 43
C8B8:99 5B 03 A9 00 85 C6 A2 2F
C8C0:00 BD B9 CB 20 D2 FF E8 EA
C8C8:C9 00 D0 F5 A9 20 8D AE 50
C8D0:A7 A9 95 8D AF A7 A9 C4 60
C8D8:8D B0 A7 A9 01 8D 06 03 3A
C8E0:A9 C7 8D 07 03 A9 36 85 0C
C8E8:01 4C 55 CA C9 4C D0 2B B1
C8F0:20 5E CA A9 4C 8D CD BD 10
C8F8:A9 03 8D CE BD A9 C0 8D 62
C900:CF BD A9 00 8D 52 03 A9 85
C908:36 85 01 A2 00 BD CD CB C0
C910:20 D2 FF E8 C9 00 D0 F5 DC
C918:4C 55 CA C9 56 F0 03 4C E5
C920:41 CA 20 B2 CA AD 86 02 52
C928:8D 54 03 A9 0D 20 D2 FF 21
C930:A5 2D 85 FB A5 2E 85 FC A0
C938:A5 2D C5 2F D0 06 A5 2E AD
C940:C3 30 F0 15 A0 00 B1 FB 96
C948:8D 55 03 C8 B1 FB 8D 56 D3
C950:03 20 EA FF 20 E1 FF D0 24
C958:03 4C 33 CA AD 55 03 C9 26
C960:80 90 11 AD 56 03 C9 80 28
C968:90 05 A9 03 4C 82 C9 A9 94
C970:07 4C 82 C9 AD 56 03 C9 1E
C978:80 90 05 A9 01 4C 82 C9 B3
C980:A9 0E 8D 86 02 AD 55 03 FA
C988:C9 80 90 03 38 E9 80 20 ED
C990:D2 FF 8D 57 03 AD 56 03 33
C998:C9 80 90 0A 38 E9 80 D0 1F
C9A0:05 A9 20 4C A9 C9 20 D2 71
C9A8:FF 8D 58 03 AD 55 03 C9 6A
C9B0:80 90 23 AD 56 03 C9 80 BA
C9B8:90 05 A9 25 4C E3 C9 A9 8C
C9C0:20 20 D2 FF A9 46 20 D2 89
C9C8:FF A9 4E 20 D2 FF A9 D0 40
C9D0:20 D2 FF 4C 14 CA AD 56 6B
C9D8:03 C9 80 90 09 A9 01 85 EF
C9E0:D4 A9 24 20 D2 FF 8D 59 DA
C9E8:03 A9 00 8D 5A 03 A9 20 93
C9F0:20 D2 FF A9 3D 20 D2 FF F3
C9F8:A9 20 D2 FF A5 7A 48 6E
CA00:A5 7B 48 A9 57 85 7A A9 5A
CA08:03 85 7B 20 A0 AA 68 85 F7
CA10:7B 68 85 7A 18 A5 FB 69 8E
CA18:07 85 FB A5 FC 69 00 85 7F
CA20:FC A5 FB C5 2F B0 03 4C 08
CA28:44 C9 A5 FC C5 30 B0 03 2A
CA30:4C 44 C9 A9 00 20 D2 FF F6
CA38:AD 54 03 8D 86 02 4C 55 1D
CA40:CA C9 4F D0 10 20 5E CA 2D
CA48:A2 00 BD DF CB 20 D2 FF 69
CA50:E8 C9 00 D0 F5 68 A8 68 E4
CA58:AA 68 28 4C 7C A5 A9 37 2C
CA60:85 01 A9 85 8D CD BD A9 4F
CA68:62 8D CE BD A9 86 8D CF 9A
CA70:BD A9 20 8D AE A7 A9 2C BF
CA78:8D AF A7 A9 8D BD A7 A7 D4
CA80:A9 CA 8D 26 03 A9 F1 8D E1
CA88:27 03 A9 4C 8D 14 A7 A9 22
CA90:ED 8D 28 03 A9 1A 8D 06 8C

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CA98:03 A9 A7 8D 07 03 A9 E4 64
CAA0:8D 08 03 A9 A7 8D 09 03 82
CAA8:A9 01 8D 52 03 A9 00 8D 76
CAB0:5B 03 A9 00 8D 00 02 60 BA
CAB8:A9 37 85 01 A9 00 8D 0E 28
CAC0:DC 85 5F A9 A0 85 60 A9 32
CAC8:FF 85 5A 85 5B 85 58 85 8A
CAD0:59 20 BF A3 AD FF FF 8D 48
CAD8:FF FF A9 01 8D 0E DC A9 BB
CAE0:95 8D 04 DC A9 42 8D 05 69
CAE8:DC A9 01 8D 52 03 A9 29 6B
CAF0:8D 02 03 A9 C7 8D 03 03 46
CAF8:A9 83 8D 04 03 A9 C7 8D 12
CB00:05 03 60 0E 01 02 03 04 E1
CB08:05 06 07 08 09 0A 0B 0C 97
CB10:0D 0F 54 4F 4F 20 4D 41 48
CB18:4E 59 20 42 52 41 4E 43 CC
CB20:48 45 53 0D 00 55 4E 44 9E
CB28:45 46 49 4E 45 44 20 42 BF
CB30:52 41 4E 43 48 20 45 52 DE
CB38:52 4F 52 0D 00 0D 12 54 94
CB40:92 4F 50 20 4F 52 20 12 17
CB48:42 92 4F 54 54 4F 4D 3F 8E
CB50:0D 00 0D 12 4E 92 4F 52 DE
CB58:4D 41 4C 2C 20 12 44 92 97
CB60:45 4C 41 59 2C 20 4F 52 3E
CB68:20 12 53 92 49 4E 47 4C 86
CB70:45 20 53 54 45 50 3F 0D 59
CB78:00 0D 44 49 53 50 4C 41 26
CB80:59 20 56 41 52 49 41 42 28
CB88:4C 45 53 20 28 59 2F 4E 57
CB90:29 3F 0D 00 0D 45 4E 54 9C
CB98:45 52 20 55 50 20 54 4F BB
CBA0:20 34 20 56 41 52 49 41 E5
CBA8:42 4C 45 53 20 28 41 2F A5
CBB0:42 2F 43 2F 44 29 3A 0D D8
CBB8:00 0D 0D 58 54 52 41 43 6C
CBC0:45 20 41 43 54 49 56 41 15
CBC8:54 45 44 0D 00 0D 58 4C 66
CBD0:49 53 54 20 41 43 54 49 77
CBD8:56 41 54 45 44 0D 00 0D 2E
CBE0:58 4C 4F 47 49 43 20 44 F1
CBE8:49 53 41 42 4C 45 44 0D 53
CBF0:00 00 00 00 00 00 00 00 88

```

Richard Penn is a prolific Commodore programmer. He lives in Montreal, Quebec, Canada.

POLYGONS

By Rowland Medler

There have been many programs published for computing the parameters of triangles, even those that aren't right triangles, but few if any have been published for polygons with more than three sides. In case you don't remember your high school geometry, a polygon is any closed plane surrounded by three or more usually straight sides.

Polygons works with any multisided figure that has four or more sides of equal length. If you know one dimension of the polygon, this program will compute all

the other possible parameters.

Typing It In

Polygons is written entirely in BASIC for the 64 or 128 in 64 mode. To help avoid typing errors, enter the program with The Automatic Proofreader; see "Typing Aids" elsewhere in this section. Be sure to save a copy of the program before you exit Proofreader.

Calculating

Simply load and run Polygons and then answer the prompts. Suppose you have an octagon, for example, and you know that each of the eight sides is 5 inches long. Enter this information, and Polygons will compute the diagonal (13.06 inches), the width (12.07 inches), the area (120.71 square inches), and the internal angle (135 degrees). If you know any one of these parameters, Polygons can calculate the others. Of course, diagonals and widths aren't meaningful for polygons with an odd number of sides.

The mathematics is straightforward though probably not of everyday familiarity. If you do architectural design or have a use for plane geometry of this level, the program should save you many hours of calculation.

POLYGONS

```

AP 0 REM COPYRIGHT 1992 - COMP
UTE PUBLICATIONS INTL LTD
- ALL RIGHTS RESERVED
QB 5 PRINTCHR$(5)"[CLR]
{11 SPACES}*** POLYGONS *
**
FQ 10 PRINTCHR$(158)
FK 20 PRINT"{14 SPACES}NEEEEEEE
EEM"
JA 30 PRINT"{11 SPACES}A N
{10 SPACES}M"
FK 50 PRINT"{12 SPACES}YA=INT
{SPACE}ANGLE T " T"
KC 52 PRINT"AB=DIAGONAL Y< ** W
IDTH**>T"
JF 55 PRINT"{12 SPACES}Y
{2 SPACES}(A R E A) T"
KC 57 PRINT"{13 SPACES}M
{10 SPACES}N B"
SD 60 PRINT"{14 SPACES}M
{2 SPACES}SIDE{2 SPACES}
N "
KP 70 PRINT"{15 SPACES}EEEEEEEE
E "
JX 75 PRINTCHR$(5)
BD 100 INPUT"NUMBER OF SIDES="
;SI
BG 110 IFSI<4THENPRINT"THIS PR

```



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OGRAM REQUIRES 4 OR MORE SIDES." :END
FK 120 PRINT "I ALREADY KNOW: (ONE ONLY)"
SE 130 PRINT "{16 SPACES}1) SIDE"
SH 140 PRINT "{16 SPACES}2) WIDTH"
SR 150 PRINT "{16 SPACES}3) DIAGONAL"
AC 160 PRINT "{16 SPACES}4) AREA"
QP 170 INPUT "CATEGORY NUMBER=" ;CA
JH 180 IF CA=(1) THEN 220:GOTO 190
KQ 190 IF CA=(2) THEN 330:GOTO 200
DX 200 IF CA=(3) THEN 410:GOTO 210
FS 210 IF CA=(4) THEN 510
DG 220 C=360/SI
RP 230 A=(180-C)/2
GS 240 INPUT "SIDE DIMENSION =" ;SD
RH 250 R=(SD/SIN(C/(180/I)))*SIN(A/(180/I))
CE 260 IF (SI)/2<>INT((SI)/2) THEN PRINT "DIAG. AND WIDTH {SPACES} ARE NOT MEANINGFUL FOR {2 SPACES} ODD";
HJ 270 IF (SI)/2<>INT((SI)/2) THEN PRINT "NUMBERS OF SIDES BECAUSE THEY DO NOT PAIR";
DS 280 IF (SI)/2<>INT((SI)/2) THEN PRINT "THROUGH THE CENTER." :GOTO 310
JA 290 PRINT "DIAGONAL {7 SPACES}=" ;PRINT 2*(R)
AC 300 PRINT "WIDTH {10 SPACES}=" ;PRINT 2*(SIN(A/(180/I)))*R
AE 310 PRINT "AREA {11 SPACES}=" ;PRINT (SI)*(SD)*(SIN(A/(180/I)))*R/2
BD 320 PRINT "INTERNAL ANGLE =" ;180-(360/SI):GOTO 620
BB 330 INPUT "WIDTH {10 SPACES}=" ;WD
AX 340 IF (SI)/2<>INT((SI)/2) THEN PRINT "YOU CAN'T SAY WIDTH OF ODD SIDED FIGURE." :END
HX 350 H=WD/2
DR 360 C=360/SI/2
JH 370 PRINT "SIDE {11 SPACES}=" ;PRINT 2*(H*(TAN(C/(180/I))))
DG 380 PRINT "DIAGONAL {7 SPACES}=" ;PRINT H/COS(C/(180/I))*2
QM 390 PRINT "AREA {11 SPACES}=" ;PRINT (H*(TAN(C/(180/I))))*H*SI
QJ 400 PRINT "INTERNAL ANGLE =" ;180-(360/SI):GOTO 620

```

```

FQ 410 INPUT "DIAGONAL {7 SPACES}=" ;DI
CS 420 B=360/SI/2
GG 430 A=90-B
GM 440 IF (SI)/2<>INT((SI)/2) THEN PRINT "YOU CAN'T DEFINE {SPACE} WIDTH OR DIAGONAL OF ODD";
AH 450 IF (SI)/2<>INT((SI)/2) THEN PRINT "{2 SPACES} SIDED FIGURE." :END
EC 460 PRINT "WIDTH {10 SPACES}=" ;PRINT (DI)*SIN(A/(180/I))
FK 470 PRINT "SIDE {11 SPACES}=" ;PRINT ((DI/2)*COS(A/(180/I)))*2
BA 480 AR=((DI)*SIN(A/(180/I)))*((DI/2)*COS(A/(180/I)))*SI/2
QJ 490 PRINT "AREA {11 SPACES}=" ;PRINT (AR)
HS 500 PRINT "INTERNAL ANGLE =" ;180-(360/SI):GOTO 620
BQ 510 INPUT "AREA {11 SPACES}=" ;AR
QH 520 AT=AR/SI/2
SH 530 B=360/SI/2
FR 540 A=90-B
SA 550 PRINT "SIDE {11 SPACES}=" ;2*(SQR(2*AT*TAN(B/(180/I))))
FP 560 IF (SI)/2=INT((SI)/2) THEN 590
CQ 570 IF (SI)/2<>INT((SI)/2) THEN PRINT "ODD NUMBER SIDES HAS NO WIDTH OR";
PE 580 PRINT "DIAG. {2 SPACES} DEFINED." :GOTO 610
PK 590 PRINT "DIAGONAL {7 SPACES}=" ;2*(SQR(2*AT*TAN(B/(180/I))))/SIN(B/(180/I))
JQ 600 PRINT "WIDTH {10 SPACES}=" ;(SQR(2*AT*TAN(B/(180/I))))*TAN(A/(180/I))*2
RE 610 PRINT "INTERNAL ANGLE =" ;180-(360/SI)
BM 620 INPUT "ANOTHER PROBLEM (A), HARDCOPY (H) OR {4 SPACES} QUIT (Q)";ES
PD 625 IF ES<>"A" AND ES<>"H" AND ES<>"Q" THEN PRINT "ONLY {SPACE} 'A' OR 'H' OR 'Q' " :GOTO 620
EQ 630 IF ES="A" THEN GOTO 600
JP 640 IF ES="H" THEN GOSUB 60035
BK 650 IF ES="Q" THEN PRINT CHR$(30);PRINT "{CLR} * THANKS. I'D BE GLAD TO HELP AGAIN " :END
HC 60035 AS="" :OPEN 4,4:Z=1023:FOR Y=0 TO 24:FOR X=0 TO 39:Z=Z+1
FS 60040 CH=PEEK(Z):IF CH>128 THEN CH=CH-128
PE 60050 IF CH<32 OR CH>95 THEN CH=CH+64:GOTO 60070

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RK 60060 IF CH>63 AND CH<96 THEN CH=CH+32
SH 60070 AS=AS+CHR$(CH):NEXT:P
PRINT #4,AS:AS="" :NEXT:
CLOSE 4

```

Rowland Medler devised this program when an architect requested the length of an eight-sided auditorium whose area was 10,000 square feet. Medler is 74 years old and lives in Gainesville, Florida. □

TYPING AIDS

MLX, our machine language entry program for the 64 and 128, and The Automatic Proofreader are utilities that help you type in Gazette programs without making mistakes. To make room for more programs, we no longer include these labor-saving utilities in every issue, but they can be found on each Gazette Disk and are printed in all issues of Gazette through June 1990.

If you don't have access to a back issue or to one of our disks, write to us, and we'll send you free printed copies of both of these handy programs for you to type in. We'll also include instructions on how to type in Gazette programs. Please enclose a self-addressed, stamped envelope. Send a self-addressed disk mailer with appropriate postage to receive these programs on disk.

Write to Typing Aids, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

ONLY ON DISK

Here is the bonus program you'll find on this month's Gazette Disk.

Weather Plus 128

By George E. Black
Adrian, MO

Use your 80-column 128 to record temperatures, humidity, wind direction, and other weather data to make accurate short-range weather forecasts.

Order the September Gazette Disk. The price is \$9.95 plus \$2.00 shipping and handling. Write to Gazette Disk, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

HOW TO TYPE IN GAZETTE PROGRAMS

Each month, Gazette publishes programs for the Commodore 128 and 64. Each program is clearly marked as being written for the 128, 64, or both. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

At irregular intervals, we publish two programs designed to make typing in our programs easier: The Automatic Proofreader, for BASIC programs, and a 128 and 64 version of MLX, for entering machine language programs. In order to make more room for programs, we do not print these handy utilities in every issue of the magazine. Copies of these programs are available on every Gazette Disk. If you don't have access to a disk, write us, and we'll send you free copies of both of these programs. Please enclose a stamped, self-addressed envelope. Write to Typing Aids, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

When entering a BASIC program, be especially careful with DATA statements, as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the com-

puter). If this happens, the only recourse is to turn your computer off and then on, erasing what was in memory. This could cause you to lose valuable data, so be sure to *save a program before you run it*. If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from Gazette, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times. {RVS} means to enter Reverse mode by simultaneously pressing the Ctrl key and the 9 key.

To indicate that a key should be shifted (hold down the Shift key while pressing another key), the character is underlined. For example, A means hold down the Shift key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight shifted A's).

If a key is enclosed in special brack-

ets, [<>], hold down the Commodore key (at the lower left corner of the keyboard) and at the same time press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the Ctrl key while typing the letter in braces. For example, {A} means to press Ctrl-A.

The Quote Mode

You can move the cursor around the screen with the Crsr keys, but you may want to move it under program control, as in examples like {LEFT} and {HOME} in the listings. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote key, you're in quote mode. It can be confusing when you are in this mode if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. Use the delete key to back up and edit the line from the beginning. Type another quotation mark to get out of quote mode.

If things get too confusing, exit quote mode by pressing Return; then cursor up to the mistyped line and fix it. If the mistake involves cursor movement, however, you must press the quote key to reenter quote mode. □

When You Read:	Press:	See:	When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT CLR/HOME		{PUR}	CTRL 5				
{HOME}	CLR/HOME		{GRN}	CTRL 6				
{UP}	SHIFT ↑ CRSR ↓		{BLU}	CTRL 7				
{DOWN}	↑ CRSR ↓		{YEL}	CTRL 8				
{LEFT}	SHIFT ← CRSR →		{F1}	f1				
{RIGHT}	← CRSR →		{F2}	SHIFT f1				
{RVS}	CTRL 9		{F3}	f3				
{OFF}	CTRL 0		{F4}	SHIFT f3				
{BLK}	CTRL 1		{F5}	f5				
{WHT}	CTRL 2		{F6}	SHIFT f5				
{RED}	CTRL 3		{F7}	f7				
{CYN}	CTRL 4		{F8}	SHIFT f7				

When You Read:	Press:	See:
	SHIFT ↑	

For Commodore 64 Only

	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	